

**Best Practices Guide:**

**Application of ISO 14000 Environmental  
Management Systems (EMS) for  
Municipalities**

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# Contents

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**Acknowledgments**

**Introduction**

**Contact Information**

**Chapter 1: Introduction to ISO 14000.....1**

**Chapter 2: Environmental Management Systems .....5**

**Chapter 3: Framework for Environmental Management Systems.....11**

**Chapter 4: A Step-By-Step Practical Approach to Developing An  
Organization or Facility Environmental Management System....19**

**Chapter 5: Resolving Key Issues and Overcoming Obstacles .....37**

**Annex A .....41**

**Annex B .....43**

**Annex C .....45**

**Annex D .....47**

**Resources for Further Information .....63**

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## Introduction

The United States Agency for International Development's (USAID) Global Center for Environment has developed the Best Practices Guide Series to provide technical information on the topics of ISO 14000 and how to integrate this into management of a municipality. This series of guides is adapted from coursework that was designed to develop technical leadership capacity in energy development and greenhouse gas emissions reduction that are both friendly to the environment and beneficial to economic growth. This guide is for senior and mid level technical staff (facility managers, directors of engineering or technical services, directors of capital planning) from municipal agencies, utilities and institutions. It provides enhanced technical, management and analytical tools for the development of municipal level and facility level ISO 14000 Environmental Management Systems. Through a contract with the Energy Group at the Institute of International Education (IIE), USAID's contractor for the Technical Leadership Training Program, The Lexington Group has prepared the *Best Practices Guide: Application of ISO 14000 Environmental Management Systems (EMS) for Municipalities*.

IIE's Energy Group provides assistance and training to government and business leaders to develop the skills and knowledge they will need to succeed in meeting their energy management and national development goals.

The Lexington Group is a management consulting firm that specializes in environmental, health, and safety (EHS) issues. Two key areas of Lexington Group's services include: *Corporate and Plant-level ISO 14001 Support* and *EMS Supply Chain Project Development and Management*. The Lexington Group has extensive experience working with plants from a wide spectrum of industries to build plant-level environmental management systems (EMSs) and obtain ISO 14001 certification. The Group has helped clients pioneer a new approach to ISO 14001: Obtaining certification at the corporate level.

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# Chapter 1

## Introduction to ISO 14000

### *Quality and Environmental Management Systems*

In the past decade many organizations, both in the private and the public sectors, have recognized the value of a systematic approach to the management of their organizations. This approach basically ensures that their management processes are linked together in a logical structure that: 1) ensures that all important aspects of the organization that can affect its ability to deliver excellent performance on its objectives and targets are addressed, 2) that procedures exist to ensure that key operations are effectively managed, 3) that management is based on data rather than general concepts, 4) that problems are addressed promptly and solutions, that to the greatest extent possible, prevent the problem from reoccurring are identified, and 5) perhaps most importantly, that performance is continually evaluated at senior levels of the organization and that there exists a continuous learning and improvement process based on the analysis of past performance.

These general concepts are incorporated into management approaches based on total quality management. Perhaps the best-recognized concept for total quality management is the Plan-Do-Check-Act cycle, the idea that an organization first develops a plan, incorporating its knowledge of its own operations and its customer requirements, then implements its plan, possibly on a pilot scale, checks to see if the plan is operating properly, and then acts to disseminate the plan throughout the organization. A key concept in systematic approaches to management is that it is a race without a finish; when the “act” step of the plan-do-check-act cycle is completed, it leads directly into the “plan” step for the next cycle of improvement.

Starting in 1987, leading multinational companies from industrialized countries began developing international management standards under the auspices of the International Organization for Standardization (ISO). The ISO was established in 1947 with the mission of developing voluntary international standards to promote international trade in goods and services. The film speed number (e.g., ISO 100) on 35 *mm* photographic film is a familiar example of an ISO standard.

In 1987, ISO ventured beyond product performance standards for the first time into the realm of management system standards by establishing the ISO 9000 series quality management standards. These standards adopted the concepts and approaches of total quality management, describing the characteristics of a *management system* that would yield quality products and services rather than specifying the *performance* of those products and services. By year-end 1998, 271,996 organizations worldwide were certified under the ISO 9000 standards, and the number is expected to continue to grow rapidly.

In 1996, ISO adopted the first and most important of the ISO 14000 series standards, ISO 14001. The ISO 14000 series standards apply a management systems approach to an organization's environmental issues. The ISO 14001 standard describes the verifiable core element of an organization's environmental management system. Organizations that meet the requirements of ISO 14001 can be certified, thereby earning the right to publicize their operations as meeting the international standard for an environmental management system. Other standards in the ISO 14001 series provide guidance on specific aspects of environmental management.

The ISO 14001 standard applies the management systems concepts of total quality management to the management of an organization's environmental issues. As in the case of ISO 9000, it does not specify a level of environmental performance, rather it describes the elements of a management system that can be expected to deliver continually improving performance. It can help both public and private organizations in:

- **Managing their interactions with the environment in a more effective, systematic manner.** The ISO 14001 standard provides a roadmap to an effective environmental management system which when properly applied, allows an organization to identify, prioritize and manage those aspects of its interactions with the environment that are covered by environmental regulations as well as those that extend beyond the requirements of environmental regulations.
- **Saving money and staff time required to manage their environmental affairs.** ISO 14001 emphasizes a preventive approach to environmental management based on the principle of continuous improvement. Many organizations have found that in implementing these principles they improve their environmental performance and also save valuable financial and staff resources.
- **Relating effectively to their neighboring communities and other stakeholders.** Many organizations have found that an Environmental Management System(EMS) provides a very useful mechanism to engage their neighboring communities and stakeholders in their environmental management programs.
- **Improving their image among their customers and stakeholders.** By managing their environmental affairs more effectively and in a manner that engages their customers and stakeholders, organizations have found that they improve their image among these groups with important indirect benefits to all aspects of their operations.
- **Engaging in a process of continuous learning.** The ISO 14001 EMS structure emphasizes a process of learning. Organizations have found that a key benefit of implementing an EMS is their ability to “learn by doing”.

The idea of international environmental standards would have seemed far-fetched as recently as ten years ago. Today, leading organizations worldwide are responding to the challenge of ISO 14001, changing their management systems and engaging in fundamentally different ways with their employees, neighbors and customers.

### *The ISO 14000 Family Environmental Management Standards*

The ISO established Technical Committee (TC) 207 in 1993 to develop the ISO 14000 series environmental standards. ISO member countries have their own corresponding technical committees through which industry, the public, academia, and government agencies provide input.

The ISO 14000 series fall into two main categories: (1) organizational management system standards, and (2) product-related standards. Only one of these standards provides for certification - ISO 14001 (Environmental Management System specification). The remainder are guidance standards.

Briefly stated, the ISO 14000 series covers the following areas:

**ISO 14001** -- Environmental Management Systems (EMS). The formal elements of an environmental management system include environmental policy, planning, implementation, verification, and management review.

**ISO 14004** -- General Guidance for developing and implementing an EMS.

**ISO 14010 - 12** -- Environmental auditing principles and guidance.

**ISO 14031** -- Environmental performance evaluation guidance.

**ISO 14020 - 24** -- Environmental labeling guidance (products)

**ISO 14040 - 45** -- Life-cycle Assessment principles and guidance (mainly products)

**ISO 14050** -- Terms and definitions

**ISO Guide 64** -- Inclusion of environmental aspects in product standards (Guide)

Although by far the greatest number of the 7,887 organizations that were certified to ISO 14001 by year-end 1998 were private sector manufacturing facilities, the principles of ISO 14001 apply to municipal governments as well. In drafting the standard, Technical Committee 207, which was responsible for preparing the ISO 14000 series standards, deliberately used the term “organization” to refer to a broad range of entities both public and private that might apply the standard. More importantly, the principles of ISO 14001 apply to any organization whose activities, products or services interact directly or indirectly with the environment.

The primary objective of this Best Practices Guide is to provide municipal managers with a basic introduction to formal environmental management systems based on the ISO 14001 model. This guide is structured to provide municipal managers with a simplified understanding of the basic elements of an ISO 14001 -based environmental management system (EMS) and a step-by-step approach for getting started with the planning and implementation of an EMS in a municipal government, facility or site. This guide is designed so that municipal managers can evaluate their environmental/health/safety programs and identify specific “gaps” that will require further work in order to meet the specifications of the ISO 14001 model. While we use as the basis for this guide the ISO 14001 specification, the objective is not necessarily to lead a municipal organization to certification of their environmental management system. In many cases the benefits of the system can be obtained without necessarily obtaining certification.

## Chapter 2

# Environmental Management Systems

### *What is an Environmental Management System?*

An environmental management system (EMS) is a systematic approach for managing an organization's environmental issues and opportunities. Good, or even "best practices" alone do not make an EMS. The essential characteristic of an EMS is that its various components interact to provide measurable information enabling continual improvements. The "systems" approach means that processes are stable and repeatable, yield more predictable outcomes and adapt new learning to continuous improvement.

The key systems components of an EMS are:

- An Environmental Policy Statement actively promoted by senior management;
- A Planning Process oriented toward integration of environmental with the organization's business and operations management;
- An Organizational Structure, responsibilities and accountability;
- Implementation Systems and Operational Controls;
- Measurement and auditing systems;
- Systems for periodic Top Management Review of the EMS.

*ISO 14001 Section 3.5 Environmental Management System (definition)*

*'That part of the overall management system which includes organization structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.'*

### ***The Costs and Benefits of an Environmental Management System (EMS)***

The costs and benefits of an EMS will vary significantly depending on the type of organization, the existing “*eco-efficiency*” of resource utilization, the potential environmental impacts and risks, the degree to which the enterprise already has implemented various elements of the system, and the premium placed by the enterprise’s customers and others stakeholders on a formal, independently audited EMS. For most organizations, actual benefits will depend on the degree to which management is willing to invest time and specific resources toward a full implementation of the EMS.

The most important resource invested in implementing an EMS will be the time of the organization’s own people. This investment of time will, however, result in substantial benefits. As the organization’s own staff develops an understanding of an EMS and its implementation, it becomes more conscious of how it affects the environment and learns how to manage environmental issues more effectively. While some of the benefits can be realized without investing in a formal EMS (i.e. through ad hoc, focused efforts), a formalized system approaches a much greater likelihood of achieving benefits consistently, and through continual improvement.

#### *What is eco-efficiency?*

*“Eco-efficiency is the primary way in which business can contribute to the concept of sustainable development....The vision of eco-efficiency is simply to produce more from less. Reducing waste and pollution, and using fewer energy and raw materials is obviously good for the environment. It is also self-evidently good for business because it cuts companies’ costs.”*

*Excerpts from the Bulletin of the World Business Council for Sustainable Development*

*This same definition of eco-efficiency can be adapted to municipalities. Both in their own activities and in their interactions with the customers they serve, municipal organizations can exert a very strong influence in promoting eco-efficiency.*

The following are some of the key benefits that a municipal government or facility may expect to gain from implementing an EMS focusing on the eco-efficiency of its own and its customers’ operations:

#### ***Operational Cost-Savings***

- greater discipline for a long-term view , focusing on the sustainability of its operations.
- higher resource productivity of purchased materials through more efficient utilization and reduced waste
- energy and water conservation savings
- improved cost controls

- improved worker health and safety, and reduced absenteeism
- reduced cost of compliance with regulations
- reduced legal liabilities, and reduced insurance premiums

#### *Customer Relations Benefits*

- improved service quality at lower cost through systematic waste reduction
- improved quality of life through improved planning, accounting for environmental quality and quality of life in municipal management
- improved upstream and downstream environmental management through the municipality's indirect effect on its suppliers and regulated community
- reduced costs through improved access to capital
- improved ability to work with business, as that have also put in place EMS (and to encourage more local businesses to implement EMSs)

#### *Potential Employee and Community Relations Benefits*

- higher employee morale and productivity
- improved employees' health and safety (and their families in the immediate community), particularly if health and safety management are included
- improved image in the community and better public relations.

Examples of the benefits attained by three U.S. municipalities that are putting in place EMSs are described in Annex C. The range of benefits obtained is particularly interesting. The City of Lowell focused on its use and recycling of paper, cardboard, batteries and lighting fixtures containing toxic substances; the City of Gaithersburg improved its operational and energy efficiency, and reduced waste disposal costs; the town of Londonderry improved worker safety and decreased water usage. In all three cases, the municipalities also benefited from improved definition of responsibilities and a more systematic approach to management. It should be noted that these benefits have been obtained by facilities that are only in their pilot stages. The true benefits will accrue as they implement the EMS throughout their operations.

#### *How Does an Environmental Management System Apply to Municipal Management?*

Municipalities, like business organizations, are complex organizations that frequently have very important interactions with the environment. When Technical Committee 207 drafted the ISO 14000 series standards they deliberately used the term "organization" rather than "business" or

“corporation” because they recognized that the principles they were developing applied just as much to municipal and other operations as they did to business functions.

Of course it is important to recognize also that municipal operations can cover a wide variety of functions and that some functions, such as water and electricity supply, waste collection, treatment and disposal, are municipally or privately operated. The needs of very large municipalities can also be very different from those of small municipalities. In general, it is useful to look at the kinds of functions that municipalities undertake in order to understand how EMSs might apply effectively to their operations.

### *Operations management*

Municipalities, like companies, manage large and small operations that *directly* affect the environment. These operations may include wastewater treatment works, thermal or hydroelectric power plants, drinking water supply plants, waste treatment and disposal facilities, public transportation systems and other similar operations. The City of Lowell, Massachusetts, in the case studies (Annex C), for example, initially focused on its wastewater treatment plant. In such cases it is important to focus first and foremost on the direct actual or potential environmental impacts of the operation itself. The EMS will identify the wastes the facility generates, the energy and materials it consumes, the environmental hazards and risks it creates, and develop management systems that continuously improve its performance with respect to those impacts. In contrast to an industrial facility, a municipal facility must account directly for the fact that the customers it serves are also the neighbors who are affected by the facility.

### *Remediation*

In other cases the municipality may take responsibility for remediating past impacts. For example, a brownfields project may convert a former contaminated site into a new use as an industrial park. In this case the EMS could apply to the cleanup operations, to the *interaction with the community* in planning the new use of the site and to the operation of the site in its new use.

### *Service delivery*

Municipalities frequently provide services to their residents--transportation, parks and recreation, garbage pickup, schools, fire and police. For example, the cities of Gaithersburg and Londonderry in the case studies targeted their Departments of Public Works with responsibility for storm water management, street and facility maintenance, and used oil, paper, and metal recycling. In these cases it is important to look at both the direct impacts of delivering the service and the indirect impacts of residents using the service. How a park system operates public restrooms is important, but so is how the park is used by community residents. Often the environmentally sound operation of public services depends on the effective *education* of the users of those services.

### *Planning and regulation*

Finally, municipalities can have a very important *indirect* effect through their planning and regulatory processes. Effective planning for future growth is probably one of the most effective ways to protect the community against the direct environmental impacts, industrial development, transportation and residential growth. An EMS can provide insight on the indirect environmental impacts in the future of present-day planning decisions about the pattern of growth. In addition, municipalities affect the environment by the requirements they impose on industrial, commercial and residential activities within their borders. Effective and consistent enforcement of regulations goes a long way toward improving the quality of life and the environment in the community, as encouragement and regulatory flexibility towards activities and entities that demonstrate a responsible approach towards the environment.

Where to start can be largely a tactical decision. A small municipality may decide to undertake a comprehensive approach to an environmental management system, looking at all its operations simultaneously. This approach would be risky for a large municipality, where the initial effort would be diluted over too-wide a system. (It is important to recognize that effective implementation of an EMS requires a significant commitment of time and effort from an organization). Therefore, a large municipality may decide at first to implement the system in only one of its operations, such as, its wastewater treatment system. The lessons learned can then be applied to the expanded application of EMS, to areas such as energy services or the drinking water supply system.

In the future it will also be important for municipal operations to demonstrate their internal compliance with regulations imposed on others. If a municipality requires industries to strictly comply with environmental regulations, it must be able to demonstrate that its own facilities such as the wastewater treatment plants are also in compliance. There are positive signs of progress, in some municipalities such as in Guadalajara and Monterrey, Mexico, and Lima, Peru, where local industries are cooperating to implement EMSs in small and mid-size enterprises. Municipalities can join or promote these efforts to demonstrate their willingness to undertake environmental initiatives in partnership with local industry.



# Chapter 3

## Framework for Environmental Management Systems

This section outlines the key elements of an EMS consistent with the requirements of the ISO 14001 Environmental Management System specification. The EMS framework has five major sections which are organized along the Plan, Do, Check, Act model commonly associated with Total Quality Management: 1) Environmental Policy, 2) the Planning Process, 3) EMS Implementation and Operation, 4) Checking and Corrective Action, and 5) Management Review.

### *Step One: Environmental Policy*

The heart and soul of the EMS is a documented environmental policy providing the municipality or facility an overall sense of direction. The policy statement sets the overall level of environmental responsibility and performance which the municipality or facility seeks.

Top management must define the environmental policy and ensure that the policy:

- is appropriate to the scale and kinds of environmental impacts of the municipality or facility's activities, products and services;
- is aligned with the services and operations;
- provides the framework for setting and reviewing environmental objectives and targets;
- includes a commitment to (1) continual improvement (2) the prevention of pollution (3) compliance with applicable environmental standards and regulations and voluntary codes and principles to which the municipality or facility subscribes;
- is documented, implemented, maintained and communicated to all employees;
- is available to the public.

For two examples of municipal environmental policies, one from Tampere, Finland and the other from Newcastle, Australia, see Annexes A and B. Note that Newcastle's is more closely aligned to a traditional ISO 14001 facility EMS policy.

## **Step Two: Planning Process**

The system components relating to the planning process are (1) a process for identifying the environmental aspects of the organization's or facility's activities, products and services, (2) a process for evaluating the significant environmental impacts, (3) a process for ensuring access to environmental standards and regulatory requirements directly applicable to the organization's or facility's activities, products and services, (4) a process for establishing the organization's internal performance standards or criteria for its activities, products and services in the absence of (or complementary to) relevant environmental regulatory standards, (5) a process for setting environmental objectives and targets with appropriate baseline performance information; and (6) an environmental management program specifically oriented toward achieving the objectives and targets.

### **1. Identification of the Municipality's or Facility's Environmental Aspects**

Essential to the planning process is a methodology for identifying the environmental aspects of the organization's or facility's activities, products and services. Environmental Aspects are the actual or potential interactions of the organizations' activities, products and services with the environment. This requirement means an ongoing process for assessing environmental risks and opportunities, risks of environmental impacts, and opportunities for improved eco-efficiencies in resource utilization and other environmental performance improvements that have direct benefits to the municipality, its community or those facilities it affects indirectly (for example facilities that are regulated by the municipality). ISO 14001 does not specify a methodology for identifying environmental aspects or evaluating their significance. As noted below, it is useful to begin with a systematic process for identifying environmental aspects and a process for prioritizing their importance based on criteria such as environmental risk, natural resource or energy use, cost, image or community impact. Whatever methodology is used, it must be capable of identifying and evaluating significant environmental issues and opportunities.

### **2. Procedures to Identify Applicable Environmental Regulatory Requirements and Voluntary Codes and Principles to Which the Municipality or Facility Subscribes**

Another component of the planning process is a procedure for ensuring access to all environmental laws and regulations applicable to the organization's or facility's activities, products and services. The procedure needs to be capable of translating applicable regulatory requirements into plain language that can be communicated clearly to operations and other managers whose responsibilities will be affected. Legal *and* other requirements of the planning process includes any voluntary codes and principles. For example, a number of municipalities have adapted Agenda 21 through public input to produce a local version of Agenda 21 outlining the community's vision for sustainability. These local agendas constitute voluntary principles to which the communities subscribe.

### **3. Setting Environmental Objectives and Targets**

A key component of environmental management system planning is the process for setting appropriate environmental objectives and targets. Objectives, in the first instance, need to fit within the overall environmental policy statement. They also must be based on identifying the municipality's or facility's most significant environmental aspects. Setting objectives and targets cannot begin until the process of identification has been completed. A related

requirement is the development of baseline information or existing environmental performance levels for each objective and (if appropriate) each target.

### **Objectives and Targets**

**ISO 14001 defines an environmental objective as:**

“overall environmental goal, arising from the environmental policy, that a organization sets itself to achieve, and which is quantified wherever possible.”

**An environmental target is defined as:**

“detailed performance requirement, quantified where practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be met in order to achieve those objectives.”

Two key points to keep in mind are first, that a target is a more detailed, more specific step along the way to achieving an objectives; second, that the organization is itself responsible for setting its own objectives and targets based on its knowledge and understanding of its interactions with the environment and the legal and other requirements that apply to it.

#### ***4. Environmental Management Programs for Objectives and Targets***

The final element in the planning process is the development of specific management programs achieving the environmental objectives and targets. These programs should assign specific responsibilities to identified individuals and contain timetables and action plans. In addition they must identify the necessary human, financial and organizational resources to ensure that objectives and targets are met.

#### ***Step Three: EMS Implementation and Operation***

The ISO 14001 standard identifies 7 specific elements in the Implementation and Operation component of an EMS. These elements are summarized below:

##### ***1. Organizational Structure and Responsibilities***

Traditional environmental management programs place management responsibilities on the facilities manager (or environmental engineer or environmental officer). Frequently, the environmental functions of the organization are functionally isolated from the core functions of its operations. As distinct functions they are viewed as being of concern only to environmental specialists. By contrast, in the ISO 14001 approach, responsibilities and management authority for implementing and maintaining the EMS are defined and documented within the many operations and functional groups of the organization or facility as a whole. Another way to put this is to say that a systems approach to environmental management requires that environmental management systems be integrated with all aspects of the organization’s operations.

To meet the ISO 14001 EMS standard, a municipality or facility needs to have a documented organizational structure which identifies the roles and responsibilities for implementing and maintaining the EMS of top and middle management, and in other relevant functions and groups.

In addition, top management must make available appropriate human, organizational and financial resources to support the EMS.

Finally, the most senior manager must appoint a management representative with specific responsibilities and authority to:

- (1) ensure that a facility's EMS requirements are defined and implemented and maintained in accordance with the ISO 14001 standard;
- (2) report to the senior manager on the performance of the facility's EMS

The role of the management representative is critical to the success of an EMS. He or she must be an individual who is trusted and respected by all management levels, with the knowledge and ability to implement the EMS, and with a personal commitment to its success. In this role, the management representative should report directly to the senior manager and be a member of the organization's top decision-making group (e.g., the executive committee). Note that all three case study municipalities in Annex C felt a major byproduct of implementing an EMS was that it defined responsibilities more clearly than in the past.

## **2. Operational Controls**

The EMS must provide for documented operational controls or procedures for each operation and activity associated with the identified significant environmental aspects. Operational controls or procedures must be devised to ensure that facility operations and activities (e.g., maintenance) are carried out minimize deviations from a facility's environmental policy (including its commitment to comply with legal and other requirements) and its environmental objectives and targets. Operational controls and procedures must specify operating criteria.

The Operational Controls component of the EMS must also provide procedures covering the identifiable significant environmental aspects of the products and services used by the facility. These procedures cover, for example, specifications for suppliers aimed at improving the environmental performance of products and packaging that they provide. The controls should also cover environmental training and related requirements for contractors doing on-site work for the facility.

The nature of operational controls will often depend on the scope and purpose of the EMS. In the case of a municipality that has regulatory responsibility for entities that it does not directly manage, controls may extend, for example, to permitting and licensing procedures. A water treatment facility may establish operational controls that relate to allowable discharges. It may require that operational controls are implemented by the industrial dischargers serviced by the facility. Operational controls may also be developed to implement an overall sustainable community plan.

## **3. Training, Awareness, and Competence**

Effective training programs, including those that raise the environmental awareness levels of all people in the organization, are a critically important element in implementing and maintaining the EMS. Depending on the nature of the operations, it may be necessary to raise the level of

awareness of the facility's users. For example, in the case of a municipal park or a school, a greater impact may result from raising the awareness of the users of the facility, than by training internal staff. Alternatively, internal staff may be trained to educate the users of the facility. Training must be approached systematically:

- (1) An environmental awareness training program must be implemented for employees covering the importance of the environmental policy and the requirements of the EMS, the significant environmental aspects of their work (and the benefits of improved environmental performance), their roles and responsibilities in carrying out the EMS, and the potential consequences of not following operating procedures. The environmental awareness training should be aimed at educating employees on how they can make a contribution to the EMS and to the facility's environmental performance.
- (2) Identified environmental training needs should include the needs of each person whose work has existing or potential control over these impacts. Each of these individuals must meet a competency standard (developed by the municipality or facility) to be achieved through education, training or practical experience.

As in the case of operational controls, the nature of training programs will depend on the scope and purpose of the EMS. Training programs developed for an individual facility will be very different than those developed for a community involving numerous actors that the municipality does not directly control. In either case however, training is the key to the success of an EMS.

#### **4. Communication**

Internal and external communication is always a formal component of an EMS.

An internal communication program establishes regular exchange of information about environmental issues and opportunities, at all vertical management levels, as well as horizontally across operating units.

An external communication program must, at a minimum, provide for a formal process for receiving, documenting and responding to complaints or enquiries from interested parties (e.g., community residents, government agencies, customers, suppliers) concerning the facility or municipality's environmental aspects and its EMS.

In addition, management must formally decide whether it will initiate an external communication (e.g., annual environmental report) concerning its significant environmental aspects, its objectives and targets. ISO 14001 does not require that a facility initiate external communication concerning its significant environmental aspects but it does require that a formal decision is made and recorded on whether or not to do so. Generally, however, best practices imply an open communications process with both the community and outside stakeholders.

Because municipal EMS's generally involve numerous external stakeholders within the community who have had an important involvement in the development of the EMS, they should be kept informed of the municipality's progress in meeting the objectives established in the

EMS. It is worth noting that local residents are both the customers for municipal services (and voters) who are most affected by the environmental soundness of municipal operations.

### **5. EMS Documentation**

The core elements of the EMS must be documented. Core elements include the environmental policy, the environmental objectives and targets, the EMS organization showing roles and responsibilities, operational control procedures, monitoring and measurement procedures, and the top management review of the EMS. In addition, the EMS documentation must provide directions or a road map to locate other relevant EMS documents such as environmental training records, EMS audit records, and regulatory permits.

### **6. Document Control**

The EMS must contain a procedure for controlling all documentation required by the EMS. A major purpose of document control is to ensure that all EMS documents can be located, reviewed, revised and approved by authorized persons. Another purpose is to ensure that the current versions of relevant EMS documents (e.g., operational procedures) are available in all locations of the facility where they are essential for the effective implementation of the EMS. Related to this purpose, document controls ensure that obsolete EMS documents are promptly removed from all points of issue and use and appropriately archived in accordance with the municipality's or facility's record retention policy.

### **7. Emergency Preparedness and Response**

The EMS is required to have an Emergency Preparedness and Response-component. This component must include procedures for identifying potential accidents and emergency situations, proper responses, and measures to prevent and mitigate environmental impacts from accidents and emergency situations. For municipal facilities it is particularly important to consider how to work with the community in emergency situations.

The Emergency Preparedness and Response plan or procedures must be reviewed and revised, when necessary, particularly after the occurrence of an accident or emergency. In addition, the procedures must be periodically tested where practicable.

## **Step Four: Checking and Corrective Action**

The EMS needs clear procedures to verify and to qualitatively (and quantitatively) measure the effectiveness of the EMS. ISO 14001 refers to this component as "checking and corrective action". This means having systems for measuring progress toward stated environmental objectives and targets. It also means having a process for verifying whether operations are in compliance with applicable environmental regulatory requirements and for periodically auditing conformity of the EMS with municipal standards (and ISO 14001). Deficiencies noted during the checking or evaluation process are called "non-conformities" in the language of ISO. The EMS requires a process for identifying and correcting non-conformities and for taking appropriate preventive actions.

### **1. Monitoring and Measurement**

The municipality or facility's EMS must include a monitoring and measurement component. This component must meet the following specific requirements:

- Documented procedures for regularly monitoring and measuring the key characteristics of municipal or facility operations and activities that can have significant environmental impacts.
- Documented procedures for tracking and recording information on performance, on relevant operational controls, and on progress toward the facility's environmental objectives and targets.
- Procedures for calibration and maintenance of monitoring equipment and retention of records.
- Documented procedures for periodically evaluating the facility's compliance - with applicable environmental laws and regulations.

In designing performance indicators it is necessary to link them to specific objectives or targets so that they will provide practical data for corrective action to meet the organization's environmental commitments.

### **2. Non-Conformance, Corrective, and Preventive Action**

The facility's EMS must include procedures defining the responsibility and authority of the person(s) (1) handling and investigating non-conformance with the EMS, (2) taking action to mitigate any environmental impacts caused by non-conformance, and (3) initiating and completing corrective and preventive actions.

These procedures must also ensure that corrective and preventive actions to eliminate causes of actual or potential non-conformance are appropriate to the magnitude of the task and commensurate with the environmental impacts encountered.

If corrective and preventive actions require changes in operational control or other documented EMS procedures, these changes must be implemented and documented.

### **3. Records**

The facility's EMS must have procedures for identifying, maintaining, and disposing of environmental records. Environmental *records are the output of the EMS* and include training records, monitoring results (e.g., air emissions and wastewater treatment), EMS audits, and regulatory permits. The environmental records management process must ensure that records are legible, identifiable, and traceable to the activity, product or service involved. Environmental records must be readily retrievable and protected against loss or deterioration. Environmental records retention times must be documented.

#### **4. EMS Audit**

The EMS Audit program is a key requirement for the facility's EMS. The overall purpose of the EMS audit is to determine whether the facility's EMS is meeting EMS standards (or ISO 14001 if it is certified), and whether the EMS is being properly implemented and maintained. The Audit program procedures must cover (1) scope of the EMS audit, (2) frequency/schedule of audits, (3) audit methodologies, and (4) the responsibilities and requirements for conducting the EMS audit and for reporting the results to the facility's management. The EMS audit must focus on priorities such as the degree of risk of specific operations and activities and the results of previous audits.

#### ***Step Five: EMS Management Review***

The municipality or facility's EMS must provide for periodic review of the EMS by top management (mayor, city manager, plant manager, General Manager or General Director). *The EMS management review is not the same as the EMS audit.* The EMS audit looks at the EMS in detail and makes judgments as to whether the EMS is being implemented in accordance with EMS standards (or ISO 14001). The EMS management review uses the results of the EMS audits, performance data gathered through monitoring and measurement, and other information on internal or external factors that pertain to the environmental performance of the organization to ensure the continuing suitability, adequacy and effectiveness of the EMS. It serves as the conscience of the facility's Environmental Policy commitment to continual improvement. The EMS management review should cover issues such as the need to revise or establish new environmental objectives and targets, revise the environmental policy, and reorient the EMS toward new opportunities for environmental performance improvements aligned with economic and other benefits.

The importance of the management review step in the successful implementation of an EMS cannot be overemphasized. It provides the opportunity when the organization's senior management can meet to review its environmental performance and the adequacy of the EMS in the light of both internal and external conditions. Stated differently, the management review phase serves as the final step in one cycle of an EMS and as the first step in a new cycle, allowing for adaptations based on lessons learned and new commitments undertaken by the organization.

## Chapter 4

# A Step-by-Step Practical Approach to Developing An Environmental Management System

This section is intended to provide an abbreviated step-by-step approach to developing a municipality or facility EMS. The step-by-step approach assumes that the municipality or facility has made a decision to build a formal EMS (or modify its existing environmental programs) designed around the requirements of the ISO 14001 EMS standard. The setting for this section is a municipal government facility. ISO 14001 envisions the possibility of a multi-site, municipal ISO 14001 EMS. But, as a practical matter, most enterprises thinking about ISO 14001 certification will undertake the effort initially at the facility or site level.

### *PRELIMINARY STEPS*

#### ***Step 1: Engage Senior Management***

*It is inadvisable to proceed with this step-by-step approach until the organization or facility's senior management commitment and support has been secured. This is a critical prerequisite.* Without senior management support it will be difficult to obtain the kind of commitment in terms of time, resources or personal involvement required to successfully implement an EMS. Such support is likely if a sound business case can be made for an EMS (looking at the practical benefits in terms of those criteria that are important to top management: cost, image, relationship with the community, etc. If top management is unlikely to be supportive, a small-scale pilot EMS implementation may be useful to demonstrate the potential benefits to the organization.

#### ***Step 2: Establish the Boundaries of An EMS***

An important initial decision to be made involves the scope of the EMS, covering what operations or facilities are to be included in the EMS. Clearly, the EMS should include operations or facilities that are environmentally important, but the extent to which the EMS covers a functional or geographic should also be considered. In many cases, as in the case study facilities described in Annex C, it is useful to “start small”. That is, select a relatively small pilot project that reflects the kinds of issues that are likely to arise in other operations. Work on the smaller, targeted area first. After learning about the project's successes and failures, the approach can be extended to additional operations based on what was found in the pilot operation.

#### ***Step 3: Establish An EMS Team***

To lead the EMS implementation effort, it is necessary to select a small team of people representing different functions and operations in the facility. The team should be led by a strong proponent of ISO, or an enthusiastic, experienced project manager. Establishing the right

team is in many respects the key step in the successful implementation of an EMS implementation process. Make sure that all the areas of the operation that can influence successful implementation of the EMS and its performance are represented. ***Do not attempt to do it alone.*** In addition, make sure that the objective of an EMS and its implementation are fully understood in advance. Team members should be aware from the beginning that EMS implementation will involve a substantial commitment of time and effort, but that it can be expected to yield important benefits in the environmental performance of the organization as a whole and of individual departments. Managers and team members may have to negotiate project schedules so that each participant can dedicate sufficient time and interest for an effective implementation.

***Step 4: Provide EMS Standards Training for the EMS Team***

To ensure that all members of the EMS team understand and communicate EMS concepts consistently, the EMS team should be trained in ISO 14001 or an adaptation of ISO 14001. In general, adaptations should be approached carefully. The standard has been applied successfully by thousands of organizations world-wide. It has been shown to work well in a wide range of applications because it has the flexibility to allow its adaptation to specific circumstances. Adaptations to standard training courses might focus not on the content of the standard, but on its implementation--how, for example, have similar organizations implemented the standard? If utilizing a course taught by a commercial course supplier, look for courses that are offered by instructors who are experienced in environmental management systems, and who are willing to draw on that experience to provide practical implementation tips. Ideally, if resources are available, the EMS manager should work with the course provider to ensure that the course is adapted to the organization's specific needs.

***Step 5: Conduct an ISO 14001 Gap Analysis***

The EMS team conducts a gap analysis comparing existing environmental (and health/safety) programs with the ISO 14001 requirements. In conducting the gap analysis, the EMS team examines the facility's existing management systems (human resource, purchasing, materials management, financial, quality, as well as environmental/health/safety). In most cases, many of the established systems already contain many elements that will prove useful in EMS implementation. Therefore, *gap analysis should be designed to identify those existing management systems elements that can be incorporated in the EMS.* The purpose of the gap analysis is to identify the gaps or areas where changes are needed and to build new systems in order to develop an EMS that will meet the ISO 14001 standard.

## PLANNING PROCESS STEPS

### **Step 6: Prepare an EMS Implementation Plan**

The output or product of the gap analysis provides essential information needed to develop an EMS Implementation Plan. The Implementation Plan will guide the entire ISO 14001 EMS implementation effort. The Plan needs to identify specific EMS elements that require development work. An EMS team member or other facility manager should be assigned lead responsibility for each major EMS work item. In addition, the Plan must identify the resource requirements, dependencies/critical interrelationships with other EMS work items, and implementation milestones/completion dates(s). Each EMS work item should be clearly described and backed with a plan or strategy showing how it will be carried out. Critical interrelationships with other EMS work items should be annotated or cross-referenced. A summary sheet showing all EMS work items (with horizontal timelines or other graphics) will provide the EMS team and facility management with a concise method for monitoring progress. The Implementation Plan must be reviewed and approved by the facility management group (facility management review of the Implementation Plan will be the first opportunity for applying the ISO 14001 Management Review process to the development of the EMS). See Table V-1 below for an example outline of a specific EMS work item in an Implementation Plan.

ISO 14001 Requirement	IMPLEMENTATION ACTIONS	Resource Requirements	Dependencies & Critical Interrelationships	Lead Responsibility	Milestones/ Completion
Sec. 4.3.2 Training (second sentence)	Identify all employees whose work may create significant environmental impacts.  Upon completion of environmental aspects review and identification of significant environmental aspects, identify specific kinds of work associated with significant aspects. Identify specific employees whose work is thus affected.		Completion of environmental aspects review and identification of significant environmental impacts.  Availability of up-to-date job descriptions for all employees.	Jaime Verdin	Within 3 months of startup  Within six months of startup

**Step 7: Develop A Process For Identifying Environmental Aspects**

An organization's significant environmental aspects are the key building blocks of an EMS. It is essential to understand what these aspects are, and to develop a systematic process for identifying them. The ISO 14001 standard requires that a process or system is developed for identifying environmental aspects of a facility's *activities, products and services*. As a practical matter, it is necessary to define boundaries of this effort and limit to the environmental aspects that the facility can control or influence. Consider dividing the universe of environmental aspects into two parts: (1) regulated environmental aspects and (2) unregulated.

**Step 8: Identify Applicable Environmental Legal And Other Requirements**

EMS standards also require that a process or system is established for identifying legal and other requirements that apply to the facility.

**Environmental Aspects****ISO 14001 Definition of Environmental Aspect:**

"Element of an organization's activities, products, and services which can interact with the environment."

**Plain language meaning:**

An "environmental aspect" signifies the *potential* for an environmental impact or its existence. A facility may have drums of fuel oil that are not leaking at this time. These drums are an aspect (because they can interact with the environment) but not an impact. Once the drums begin to leak they become an impact (but also continue to be defined as an impact). The fact that these drums have the potential for environmental impacts makes them an "environmental aspect" within the meaning of ISO 14001 whether they are leaking or not. It does not matter whether the activity, product or service is regulated to protect the environment. What matters is only that there is a *potential* for an environmental impact under reasonably foreseeable conditions including absence of voluntary or regulated environmental controls, legal environmental releases of air emissions and wastewater effluents (i.e. below regulated limits), accidents, breakdowns of environmental pollution controls, misuse of products by consumers, and improper end-of-life product disposal by customers.

**Identify Regulated "Environmental Aspects" and Legal Requirements for Facility Operations**

Many countries have established environmental/health/safety regulatory requirements for municipal facilities. Activities typically covered include certain types of air emissions, wastewater effluents, noise, and hazardous waste. Legal requirements also include permits, approvals, registrations, record keeping and reporting requirements. The facility may already have checklists, compliance procedures, or compliance audit protocols, which identify all applicable regulatory requirements. If the facility does not have the tools, it will need to develop them to meet the requirements of identifying applicable regulations and demonstrating its effective regulatory compliance management systems.

**Practical Pointer**

Other requirements are voluntary codes of conduct and principles to which the municipality or facility voluntarily subscribes. Examples include the CERES Principles and local Agenda 21s developed by communities.

**Table VI - 2****Selected Types of Regulatory or Quasi-Requirements Affecting to Municipal Operations**

Category	Examples
Environmental Standards	<ul style="list-style-type: none"> <li>Water and Air Regulations specifying allowable discharges to air or water, solid and hazardous waste regulations.</li> </ul>
Environmental Disclosure	<ul style="list-style-type: none"> <li>Rare in most countries, but clearly a future trend: reporting to the community on the environmental effects of the municipality's operations.</li> </ul>
Bans/Restrictions covering toxic materials	<ul style="list-style-type: none"> <li>Phase-out of specific materials used in certain operations. These materials may include lead-based gasoline, certain cleaning products, asbestos, CFC's for use in refrigeration systems</li> </ul>
Zoning and planning restrictions	<ul style="list-style-type: none"> <li>Standards established by the municipality, state or federal government concerning the siting of industrial or municipal facilities.</li> </ul>
Tax and Fiscal Incentives	<ul style="list-style-type: none"> <li>Concessions granted by municipal, federal or state governments to encourage (or discourage) specific types of industries or growth.</li> </ul>
Regulatory Flexibility	<ul style="list-style-type: none"> <li>Concessions in number and frequency of inspections or other regulatory requirements granted in exchange for verifiable evidence of consistently superior environmental performance.</li> </ul>

**Consider Non-regulated Aspects**

Do not overlook the municipality or facility's *non-regulated* environmental aspects. There is an important difference between a "systems" approach to environmental management (such as ISO 14001) and conventional environmental compliance management. Compliance management focuses on regulated environmental aspects and seeks to ensure full compliance with applicable regulatory requirements. An EMS systems approach looks at both regulated and unregulated environmental aspects, and seeks to identify opportunities for improving the environmental performance of both.

In the case of municipal governments or facilities, in contrast to manufacturing facilities, many of the important environmental aspects will be associated with the *services* that are provided to customers. A municipality supplies its customers many services that interact with the

environment directly. For example, if it provides transportation services, garbage pick-up and disposal, wastewater treatment and disposal, clean drinking water, or energy, it has a direct positive or negative effect on the environment. A municipality should consider how these services interact with the environment, perhaps listing their positive and negative aspects, if these operations lie within the scope of the EMS.

In many cases, the *indirect* environmental effects of the municipality's services can be as important (or more important than) as the direct effects. For example, the planning process that the municipality undertakes to accommodate future growth can have very definite consequences for both the environment and the quality of life of the community. If the municipality regulates industrial or commercial facilities within its borders, its methods of regulating can have important environmental consequences. If it makes decisions about what kinds of new industrial or commercial facilities are to be permitted and where these activities are to be located, it can have a very strong positive or negative effect on the environment. Frequently, these advance decisions present opportunities to exert an important influence at a much lower cost. For example, it is a great deal more costly to the municipality and to the facility (and less effective environmentally) to regulate an industrial facility in the middle of a residential area than one in an industrial park. Careful planning could greatly reduce the long run cost to both the facility and the municipality.

### *Engage the Local Community*

For municipal governments and facilities, the local community is its customer base (and it is important to think of the community as customers for whom valued services are provided). Community members are also the people most affected by the environmental consequences of a municipality's decisions. If inadequate garbage pickup and disposal are provided, or if the air and water are contaminated in supplying energy or wastewater treatment, the community/customer is affected. The community, therefore, can be an important ally in developing an EMS that is responsive to its needs, and in building support for the EMS. They need to understand the EMS process that the municipality or facility is undertaking, and to voice their greatest concerns for the environment. Engaging a local community is particularly important for municipalities. In some case studies described in Annex C, municipalities found that a lack of community interest became an obstacle, and thus sought to engage the community as partners.

### **Step 9:           *Compile And Present A Facility's Environmental Aspects***

Using the approaches and tools discussed in Step 6, review the facility's activities, products and services and their potential interaction with the environment. The simplified matrix adapted from the ISO 14004 General Guidelines (shown below with examples) can then be used as a tool for compiling and presenting the facility's environmental aspects.

Activity	Aspect	Impact
Handling oil or hazardous materials	potential for accidental spillage	contamination of soil or water
Product	Aspect	Impact
a road or park being developed	increased use of a given region or area, possibly an ecologically sensitive area	congestion, air pollution or water pollution, habitat destruction
Service	Aspect	Impact
Vehicle maintenance	release of volatile fuels during refueling	contamination of air quality
Planning or regulation	encouragement or discouragement of certain types of industrial, residential, or commercial activities	congestion, quality of life, habitat destruction.

### **Step 10: Identify Significant Environmental Aspects**

Identifying significant environmental aspects is basically a process of setting priorities. To borrow from the concept of quality management (which is very closely related to environmental quality management), the purpose should be to identify the 20% of the environmental aspects that account for 80% of the actual or potential environmental impact. Once the most significant aspects are addressed, it is possible to then focus on aspects of lower significance. It is not a bad rule of thumb to classify no more than 20% of total environmental aspects as “Significant” at any one time.

#### **What is “Significant”?**

There is no standard for determining the significance of a facility’s environmental aspects. In fact, the ISO 14001 standard defines a “significant” aspect as one that can have a “significant” impact on the environment. It is up to the EMS team to apply appropriate criteria and determine the level of significance in a way that makes sense to the business, taking into account the nature of the environmental aspects and impact risks, regulatory and legal liability factors, and the interests of the community and other stakeholders.

Classification of “significant” environmental aspects is a requirement of ISO 14001 and will be a major building block- for any EMS. The following key components of an ISO 14001 EMS are dependent on the identification of the “significant” environmental aspects:

- Setting environmental objectives and targets,
- Identification of training requirements and establishment of operational controls,
- Development of monitoring and measurement systems.

For classification purposes, examples of criteria that might apply to municipal operations may include:

- Impact on quality of life in the community

- Impact on long-term growth trends in the community (the nature of industry that would be attracted, the growth of environmentally friendly activities, transportation and service requirements)
- Impact on particular demographic groups in the community

**Practical Pointer**

Use several criteria in determining which of a facility's environmental aspects are significant. Additional criteria may include:

- |                                 |                                  |
|---------------------------------|----------------------------------|
| • scale of environmental impact | • potential legal exposure       |
| • severity of impact            | • difficulty in reducing impact  |
| • probability of occurrence     | • cost of reducing impact        |
| • duration of impact            | • concerns of interested parties |

Graphing significant environmental aspects is a very useful way to communicate clearly with facility management, as well as with facility employees and members of the community concerning the opportunities for environmental, financial and community benefits of addressing significant environmental aspects. One approach that has worked effectively with diverse audiences relies on visual symbols. For example aspects can be listed on the left-hand column of a chart. These aspects become the rows of a matrix. Create columns for each criterion down the page. In each cell, insert either an open circle (the aspect is not important based on this criterion), a half-filled circle (it is moderately important) or a fully-filled circle (it is very important).

It is essential to develop decision rules for what is considered significant. For example, any aspect that is very important along one or more criteria is significant, but an aspect must be moderately important across three or more criteria to be considered significant. Beware of numerical schemes that rate aspects, for example on a scale of one to five and then sum the scores for each aspect. These schemes frequently “compare apples and oranges”. It is possible that an aspect with a low total score is very important utilizing one criterion, but not important utilizing another. An aspect can be extremely important only along one dimension and be significant, but it would not appear significant if the decision rule were based on the total score.

**Step 11: Develop/Update An Environmental Policy**

If the municipality or facility does not already have a documented environmental policy, it will need to be developed. To meet the ISO 14001 requirement, the environmental policy must be relevant to the nature and scale of the environmental impacts of the municipality or facility's activities. The policy may serve as a framework for setting environmental objectives and targets. However, if such a policy is too diffuse and abstract to meet the EMS requirements, the organization may need a modified version, tailored to the specific environmental aspects relevant to the its activities, products and services.

The starting point for a facility's environmental policy is that it must be consistent with the municipal or facility mission (if there is one). Another critical starting point is the early and active involvement of the facility's senior management and client community.

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To the extent possible, articulate environmental commitments that connect the facility's significant environmental aspects with its mission when drafting the environmental policy. For example, in the transportation planning department the mission is to provide convenient and safe transportation for the community taking into account future growth. In this case, environmental policy might include a commitment to provide environmentally sound transportation. This may include the use of incentives for low emissions vehicles, car-pooling and use of public transportation. In an EMS for a municipal power generation facility, environmental policy might focus on maximizing the efficiency of conversion of other forms of energy into electricity, the reduction of greenhouse gas emissions, or the ability of the facility to sell greenhouse gas emissions credits in the future.

**Practical Pointer**

Don't overlook the specific commitments that ISO 14001 expressly requires in a facility's environmental policy:

- Compliance with applicable environmental laws and regulations
- Prevention of pollution
- Continual improvement

**Step 12: Set Environmental Objectives and Targets**

Developing environmental objectives and targets is a critical part of the EMS planning process. ISO 14001 does not require that environmental objective/targets be established for each significant environmental aspect. Narrow the selection process to those significant environmental aspects that offer opportunities for

improvement with cost savings or environmental or community quality improvements. Many of these opportunities may result from improved raw materials management tied to higher product yields and reduced waste outputs. Other opportunities may be found in improved planning process, community relations or service delivery.

Environmental objectives are broadly stated goals which may be quantified whenever practical. Examples are:

1. Reduce waste from materials used in site activities by 25% by the end of the calendar year;
2. Reduce releases of solvents used in vehicle maintenance operations by 50% in the next 12 months;
3. Reduce energy consumption by 20% in 18 months; and
4. Implement a planning process that incorporates both municipal and industrial activities and accounts reduces per capita vehicle miles by 15% over the next 3 years.

Note that in each of these examples, it will be necessary to establish *baseline data* for purposes of determining whether the specific percentage reductions have been achieved.

An environmental target is a detailed performance requirement, quantified whenever practical, necessary to achieve an environmental objective. An example of an environmental objective with appropriate targets is shown below. It should be noted that the objectives and targets in the case study examples of Annex C are somewhat more general than desirable. As the facilities in question further develop their EMSs, they should establish more clearly defined targets, specifying quantitative goals and dates of completion.

**Practical Pointer**

Avoid setting more than a handful of environmental objectives in initiating an EMS. With too many objectives, an organization may lack capacity to carry them out effectively. The resulting loss of focus can severely impede progress towards meeting environmental objectives, and, in turn, can affect organizational morale.

**Table VI-3****Example of an Environmental Objective with Targets for a Municipal Electricity Supplier**

Objective: Reduce Greenhouse Gas Emissions by 35% over the next two years

Target #1:	review and revise maintenance and operational procedures in all operations within 6 months to ensure maximum energy efficiency
Target #2:	replace boiler A in unit "3" with a more energy efficient model within 12 months
Target #3	design and implement a public education campaign focusing on energy conservation within 18 months
Target #4:	convert units 1 and 2 to natural gas within 2 years.

**Practical Pointer**

Environmental objectives and targets must be quantified whenever practicable. Documented procedures are also important for measuring progress toward objectives and targets.

This requires a consistent measurement system. There are no formal standards in developing such a measurement system. Consider using both qualitative and quantitative measurement approaches. A qualitative measurement system applies subjective judgment based on uniform criteria to measure progress. For example, assigning a number on a scale of 10 to 50 (50 = 100% completion) can be useful measuring the implementation progress of the above three targets to reduce solvent releases. Quantitative measurement of performance uses objective targets such as quantities of energy or water consumed per unit of output and amounts of wastes reduced or recycled. Progress towards quantified objectives and targets is measured by comparing new data to an established baseline performance level. For example, if an environmental objective is to reduce solvent releases by 50% by 6/30/97, information will be needed on the total solvent releases for the baseline year (e.g., 1996).

**Step 13: Establish Programs for Achieving Environmental Objectives**

After setting a manageable number of environmental objectives and specific targets are established, environmental management programs must be developed to achieve these objectives and targets. At a minimum, ISO 14001 requires that such environmental management programs (1) designate the person(s) responsible for achieving targets and objectives at each relevant function and level within the facility, and (2) the means and timetables for their accomplishment. The EMS team should also provide a budget, specify other resources (e.g. people), and schedule progress reviews by management.

## IMPLEMENTATION AND OPERATIONAL STEPS

### **Step 14: Develop an Organizational Structure for an EMS**

The appropriate organizational structure for a facility's EMS will depend, in large measure, on its culture and existing organizational arrangements. The key idea is to integrate environmental responsibilities with facility operations and business management. Rather than creating a new "Environmental Department" with responsibilities for implementing the EMS, management should allocate specific EMS planning, implementation, and operational responsibilities within existing operations and business functions. This is difficult to do but more effective.

#### **Practical Pointer**

For each environmental objective, develop an "action plan" showing the detailed targets, person(s) responsible (including people in different departments or functions if more than one group is involved), means, budget, timetables and review schedules.

An EMS organizational structure should cover the following types of responsibilities (examples of type of position for each):

- Developing and approving environmental policy (municipal manager, elected official, facility General Manager)
- Designating a management representative with overall responsibility for EMS (senior operations or functional manager e.g., finance)
- Identifying applicable legal/regulatory and other requirements (a senior operations manager)
- Assuring compliance with applicable regulations (facility manager or senior operations manager)
- Establishing a process for identifying and updating significant environmental aspects (EMS team)
- Setting environmental objectives and targets and management programs (a manager/employee needs to be assigned to each objective, target and action plan)
- Developing operational performance criteria and controls (operations managers with technical support from EMS team)
- Developing and implementation of training requirements (operations managers with technical support from EMS team)
- Conducting EMS audit and reporting results to Plant Manager (a senior operations or functional manager such as finance)
- Conducting Management Review (General Manager and senior operations managers)

An organizational chart showing specific responsibilities and reporting relationships needs to be prepared to reflect the organizational structure.

**Step 15: Develop and Document Operational Criteria and Controls**

Use the information from Step 8 (identification of significant environmental aspects) to identify specific facility operations and activities associated with significant environmental aspects. Develop appropriate operating criteria and control procedures for each operation and activity that may involve significant environmental impacts. An example is operating criteria and control procedures for treating wastewater before it is discharged from the facility. Another example is a documented procedure to ensure compliance with an applicable environmental (health & safety) regulatory requirement.

Documented operational control procedures also need to be prepared for outside contractors conducting work on-site (to the extent that the work poses significant environmental, health and safety impacts). Control procedures are also required for minimizing significant environmental impacts from incoming raw materials such as hazardous substances. When relevant, documented control procedures relating to materials/services from suppliers/contractors need to be communicated to the suppliers/contractors.

**Practical Pointer**

It is often useful to engage the people responsible for a given operation in developing the control procedures to be established. Often, line workers have important insights based on practical experience as to how operational controls can be improved. It is also useful to conduct a “root cause analysis” for significant environmental aspects. A root cause analysis essentially asks, “What can (or did) go wrong and why?” to get at the root cause of the problem. For example, a significant aspect (excess contaminant levels in wastewater discharges) may be traced to a faulty piece of equipment, which, in turn, was caused by lack of timely maintenance. The reason for the lack of timely maintenance might be inadequate maintenance operator training in the use of training logs. This suggests that the long term solution to address the problem of excess contaminant discharges would be to establish procedures for tracking periodic maintenance, and to train operators in the importance and application of these procedures.

**Step 16: Develop Training Systems and Program**

Use the information from Step 8 (identification of significant environmental aspects) to identify each employee whose work may create or contribute to significant environmental impacts. For each such employee, identify the training requirements to help minimize these potential impacts. Establish a training program that carries out the indicated employee training over a period of time (e.g., one year). Document the process and the training programs. As noted in the case studies in Annex C, employee training proved to be an important mechanism to improve morale, giving employees a broader sense of the mission of their organization.

**Practical Pointer**

Employees should have job descriptions that include their responsibilities for minimizing specific kinds of potential significant environmental impacts associated with their work. These job descriptions should also specify their environmental (health and safety) training and competency requirements.

Combine the environmental (health and safety) awareness training effort with the internal communications program.

**Step 17: Develop and Document the Facility's Emergency Plan**

If the facility does not already have an emergency plan, develop and document an emergency preparedness and response plan and procedure covering potential emergencies such as fire and accidental spills of hazardous materials. The plan needs to identify the emergency response team members (by name) and by work shift (if more than one work shift). Ensure that the response teams are properly equipped and trained in specific types of potential emergency situations. Consider providing emergency response teams with special incentives. Conduct periodic tests of the emergency plan.

**Practical Pointer**

Remember that in developing an emergency plan, consider not only the people who work in the facility's own operations, but also the people who live in the community.

**Step 18: Develop and Document Communication Programs**

The internal communications program should be combined with the environmental (health and safety) awareness training requirement (see Step 13). The internal communications program should include:

- Procedures for reporting any environmental (health and safety) incident (e.g., spill of small container of solvents);
- Awareness training for employees and managers of the facility;
- Communicating environmental performance results ("good news and bad news") concerning the overall EMS among operations and functional managers to develop a team approach to performance improvements;

**Practical Pointer**

Information on "Incidents" should be tracked not only for regulatory compliance purposes but also to determine if additional training and operational controls are required.

The nature and content of the external communications program will depend on whether the senior municipal or facility management wants an external environmental initiative. Such communications decisions should always be documented. Even if the facility's senior management does not want an external environmental initiative, ISO 14001 requires a formal procedure for receiving, documenting and responding to inquiries/complaints from the community or other "interested parties" concerning the facility's environmental aspects and its EMS.

**Practical Pointer**

Consider using short (e.g., 15 minute) focused awareness training presentations -perhaps led by a department or operations manager -- to specific groups of people at the facility. This helps avoid disrupting the work of the entire facility. Consider developing a series of “key messages” for all facility employees. Each key message would identify a significant environmental aspect of the facility’s activities, products, and services, and would say concisely what the facility is doing about it, and how each employee can contribute to this effort. Try to show the economic as well as environmental performance improvement benefits of the effort. Key messages can be communicated in various ways such as posters, electronic signs, banners, newsletter and periodic communication from the facility General Manager.

Generally, municipalities or municipal facilities will find it useful to go substantially beyond the minimum requirements of ISO 14001 in their external communications. Transparency is the best policy, particularly when the municipality’s customers are also its residents and have a strong stake in its environmentally sound operation. The success of communication efforts can be even greater by providing customers and neighbors with timely information on the facility’s performance in addressing those aspects and in meeting objectives and targets.

**CHECKING AND CORRECTIVE ACTION STEPS****Step 19: Develop Monitoring and Measurement Systems**

Use the information from Step 15 (specific operational criteria for facility operations and activities associated with significant environmental aspects) to define key characteristics of these operations and activities that will be monitored and measured.

Measurement criteria and monitoring methods must be developed that can be consistently applied to these key characteristics.

**Practical Pointer**

Measurement criteria and methods should be as simple as possible and seek to provide consistent indicators of progress and impacts. Provide as much precision as is required to meet the need. When measuring a compliance requirement very precise measurements are needed. On the other hand, methods that yield qualitative data can work quite effectively to measure progress in implementing EMS subsystems or components, and meeting objectives and targets. Don’t lose sight of the overall objective of using measurement systems to determine whether a facility is making progress towards environmental goals.

Each objective and target established in Step 10 above should be associated with specific baseline information and improvement measures. It is important to determine what percent of the objective has been met, whether activities are on schedule, or whether they should be accelerated to meet timing constraints. Performance measurement is a particularly important component of an EMS. It is used to track the performance of a municipality or facility in meeting its commitments established in its policy, and objectives and targets. The ISO 14031 standard, environmental performance evaluation, suggests three types of indicators:

- **Management indicators** that track actions to ensure that an EMS is properly implemented. An example of a management indicator might be number of hours of environmental training provided to staff during a given period. Frequently management indicators are so-called “leading indicators” because they tell us what we are doing today in order to prevent problems tomorrow.
- **Operational indicators** that track the operational results of a facility’s actions to improve environmental performance. An example of a management indicator might be kilograms of biological oxygen demand discharge per day by a water treatment plant, or micrograms of contaminant per cubic meter of air discharged. In the case of a planning-oriented EMS they might included the change in the number of acres of “green” land developed in a given period, change in vehicle miles traveled per year, or acres of brownfields recovered in a year. Operational indicators are often expressed as flows or rates (i.e. the number of units in a given period of time).
- **Environmental indicators** that express the actual ambient condition of the environment affected by a facility’s operations. These indicators might be expressed as concentrations of contaminants in the air, or water, or, as more qualitative descriptors of the physical condition of the environment (though it is useful to strive, whenever possible, to express all indicators in verifiable quantitative terms).

**Step 20:        *Develop and Document a Procedure for Periodic Evaluation of a Facility’s Compliance With Applicable Environmental (Health and Safety) Regulatory Requirements***

If a facility already undertakes periodic environmental (health and safety) compliance audits, the compliance audit system will meet this requirement (assuming the audit results are reported to the facility’s General Manager).

If compliance audits are not used, consider developing a set of compliance checklists based on the applicable environmental health and safety regulatory requirement. Provide compliance checklists to operations managers responsible for each of the facility operations and activities that have significant environmental aspects (see Step 8), and require each manager to review compliance in that department or work area and provide reports to the facility General Manager. This process should be conducted periodically.

**Step 21:        *Develop an EMS Audit Program***

The EMS Audit program is a key component of the EMS. EMS Audit protocols, covering specific elements and components of the EMS (based on the ISO 14001 standard), must be developed. The EMS Audit program should be led by a senior facility operations or functional manager (e.g., finance) using employees from the facility who have been trained in EMS auditing. The purpose of the EMS audit is to identify any non-conformities between EMS requirements and observed practices and measurement results. Another important purpose of the audit is to provide assurance to the facility General Manager that the EMS is being properly implemented and maintained.

The EMS Audit program procedures should designate and assign the responsibilities associated with conducting the audit and reporting the results to the facility's General Manager. The audit procedure must also specify the scope of the EMS audit, frequency of audits/audit schedules, and audit methodologies.

**Practical Pointer**

ISO 14010 "Guidelines for environmental auditing - General principles", ISO 14011, "Guidelines for environmental auditing - Audit procedures for environmental management systems", and "Guidelines for environmental auditing - Qualification criteria for environmental auditors" provide some assistance in developing EMS Audit program procedures. These are voluntary guidelines for ISO 14001 certification.

**Step 22: Develop a Procedure for Managing "Non-conformities"**

A "non-conformity" is defined as a departure from the EMS, legal and other requirements that directly apply to the facility, based on a measurement result or other observations. Non-conformities may be detected during periodic compliance evaluations (Step 18 above) or during EMS audits (Step 20). A formal procedure for managing non-conformities needs to define the person(s) responsible for conducting factual examinations, and for taking action to mitigate or correct any resulting environmental (health and safety) impacts. In addition, non-conformity procedures should define the criteria and responsibilities for initiating and completing corrective and preventive actions.

**Step 23: Develop and Document a Management Review Procedure**

The Management Review procedure needs to identify the facility's top management review group (for example, facility's General Manager and one or more senior operations managers). The procedure must also define the frequency of Management Reviews (ISO 14001 does require a specified frequency). The initial Management Review should begin with Step 4, with a review and approval of the facility's EMS implementation plan. The following review should discuss and approve the facility's Environmental Policy (if one is required) and the environmental objectives and targets. Subsequently, Management Reviews should focus on progress towards objectives and targets, compliance evaluation and the results of EMS audits. Use minutes of Management Review meetings or other methods of documenting the reviews.

**Step 24: EMS Documentation, Document Control and Records**

ISO 14001 requires that the core elements of an EMS and their interaction are described and periodically updated. This can be done either on paper (e.g., an EHS Management System Manual), or electronically (e.g., a computer-based system). The core elements of an EMS are the 17 numbered elements in the ISO 14001 standard, the first of which is the requirement to define a facility's environmental policy. In describing core elements of an EMS and their interaction, do not feel obligated to describe them in the sequence in which they appear in ISO 14001. The organization may already have an EHS Manual covering some of these core elements, which are organized differently than in the ISO 14001 standard. It is not necessary to change the Manual to conform to the 14001 format. Just make sure that all of the 14001 core elements are appropriately covered in the Manual.

ISO 14001 also requires that an EMS documentation contain directions, or a roadmap showing the locations or access points to related environmental documents such as operational control procedures and records.

**Practical Pointer**

An EHS Management System Manual should be fairly brief, non-technical and easy to read. Use references to indicate the locations of other relevant environmental, health and safety documents.

ISO 14001 also requires that a Document Control system be established for controlling all documents required by the ISO 14001 specification. Document control procedures, among other things, ensure that current versions of required documents are available at all locations where they are needed, and that obsolete documents are promptly removed from all points of issue and points of use.

**Practical Pointer**

If a facility is ISO 9000 certified, use the same document control system required for the ISO 9000 standard.



# Chapter 5

## Resolving Key Issues and Overcoming Obstacles

This section briefly highlights some lessons learned from the experience of U.S. companies. We focus on key issues and obstacles to adapting and implementing a formal environmental health/safety (EHS) management system. We summarize approaches to overcome these obstacles.

### *1. Gaining Senior Management Commitment*

Gaining the full and complete support of senior management is the single most important challenge in establishing a formal EHS management system in an organization or facility. Without such a commitment, it is very unlikely that an EHS will succeed.

Let's assume a "typical" case. The Mayor or General Director of a municipality (or plant General Manager) has already said he is in favor of programs for environmental protection. But his commitment is suspect, likely rhetoric rather than reality. When a proposal for action is made, he gives a "yes" and a nod of approval, but the EMS team finds that, in practice, environment is near the bottom of scheduled priorities.

One problem may be that the senior manager has not yet 'internalized' the economic and social benefits of introducing formal EHS management systems. He, or she may view the environment as important and a good thing for the organization, but may not be convinced it is a business issue, in terms of either reduced or avoided costs, or new revenue opportunities.

### *Overcoming the Obstacle*

Think through the business and community case for introducing a formal EHS management system to an organization or plant. It is essential to develop preliminary financial analyses of returns on investment needed to achieve more efficient resource utilization (higher product yields, lower waste outputs, disposal costs etc.). The long-term benefits to the community must also be analyzed. They can also have significant political consequences that affect the ability of municipal managers to be reelected. The strategy may also include consideration of the effects of an EMS on the quality of life in the community, its ability to attract investment, both nationally and internationally. Potential improvements in the environment can add to the attractiveness of the municipality and enhance its ability to attract loans from multilateral and international lending institutions. Also include cost reduction benefits and higher employee productivity from environmental awareness training, and mobilize employees to identify specific environmental improvement and waste reduction opportunities in their daily tasks. Other

potential benefits include reduced safety incidents and potentially reduced liabilities, reduced insurance premiums. Planning and implementation costs must also be identified.

**Practical Pointer**

Develop a business and community case in the form of a brief presentation and take it to a senior manager with whom there exists a personal relationship. Test the presentation in private with this senior manager and get advice on improving the message. If the senior manager is in a position to do so, ask him or her to sponsor the effort before the management committee, to making a formal presentation and proposal for introducing the EHS management system concept. Make it clear to those managers who seem committed that their active support is a critical ingredient for success, and be prepared to show what their approval implies in terms of time commitments, roles, and responsibilities.

## 2. Gaining Middle and Operations Management Support

Even if senior management offers a clear and active commitment to the EHS, it is still necessary to gain the active support of middle and operations managers. Operational managers already have many responsibilities and may view the EHS management system as just one more project placed on their table. Yet gaining the active support of operations and other middle managers is *essential* because they often have control over the human and financial resources required for effective implementation of the EHS management system.

### *Overcoming the Obstacle*

A convincing case must be made to operations and middle managers, showing why it is in their interest to support the EHS management system. The most effective way to do this is to demonstrate the practical benefits they will share from implementing an EMS. Ideally, senior management could change the performance reward system so that middle and operations managers are rewarded for meeting the environmental (health and safety) objectives and targets established in the EHS management system. Annual performance appraisals of middle and operations managers need to be changed so that their personal performance is evaluated in terms of their contributions to the success of the EHS management system, objectives and targets. Reward systems, however, are difficult to change and can be manipulated. Young managers need the wise counsel of a senior manager (mentor) to understand some of the tricky issues and traps. Introducing reward systems to address environmental (health and safety) objectives will require approval and support for the organization's Managing Director or other top managers.

## 3. Employee Awareness Training

A newly introduced EHS management system often encounters passive resistance from many employees unless there is an effective awareness training program. Such a program can convincingly demonstrate the nature of the problems the EHS is trying to solve, how employees can help, and the benefits for both the organization (plant) and the employees.

### ***Overcoming the Obstacle***

Develop an EHS awareness training program as a part of the EHS management system during the planning process. Emphasize the benefits of the EMS to the workers in their workplace, to the communities in which they live and to the health of the environment for their children and future generations. Build the awareness training program around the environmental policy statement and the EHS objectives and targets. The EHS awareness training materials must explain why the municipal government or facility is formalizing its EHS management systems, identify specific benefits (EHS performance improvements and financial), and their impact on employees (e.g., greater workplace health and safety, cleaner environment in the community, improved job satisfaction), and the important role of employees in achieving EHS objectives and targets and in implementing the EHS management system. Start with only a few high-priority EHS objectives and targets, and develop simple messages for each objective, which can be delivered through means such as electronic message boards, bulletin boards, posters, large banners, videos, and personal communication to groups of employees by managers.

#### **Practical Pointer**

Do not attempt any significant implementation work on an EHS management system until a sustained and very visible EHS awareness training program is in place. This might take several months, but the initial awareness training effort will greatly facilitate implementation. Pay particular attention to the EHS objectives and targets.

### ***Concluding Comment***

This best practices manual is intended to provide municipal managers with a basic, practical framework with which to start the process of establishing a formal environmental management system at the facility level within their enterprise. The process of developing an EMS is a process of continual learning from experience. Learn from early successes and failures, and make sure to keep in touch with others in the organization or other organizations going through the same struggles. In the long run, organizations learn best from themselves and others like them.



# Annex A

## Environmental Policy

### *City of Tampere, Finland*

On the 14th of December 1994 , a commitment was made by the Tampere City Council to implement an environmental policy program to carry out Rio's Local Agenda 21 and Aalborg Charter. Included in the policy were goals and principles for the protection of the environment in Tampere. The principles have been integrated into city planning and they are considered in decision-making processes. A balance between economically possible, socially acceptable and ecologically sustainable development is sought

#### GOALS

##### **1. Tampere will develop as a leading municipality in environmental protection**

In developing the City, a pleasant living environment and environmental protection are taken into account. This status and positive publicity will attract new people and environmentally aware companies to Tampere.

##### **2. Ecological criteria are corporated into community planning**

The following criteria are taken into account in all land use planning: reducing traffic, utilizing the current infrastructure and preserving the natural environment. The pleasant environment of the city is improved by protecting the urban environment and its historic buildings, which form a part of the local cultural heritage.

##### **3. Environmental education is instituted as part of the core curriculum**

For environmental protection to succeed, each decision maker, official and citizen should consider environmental matters and aim to follow the principle of sustainable development in their own lives. Therefore special emphasis is given to environmental matters in education and schooling. Citizens should be aware of the effect that their own actions can have on the state of the environment.

##### **4. The quantity of solid waste is reduced**

The amount of waste generated is taken into account in City purchases. Products with less packaging and with lower environmental impacts are chosen. Re-usable and long-lasting goods are preferred to disposable goods. Recycling and efficient use of goods are highlighted by encouraging citizens and municipal personnel to use recycling facilities and to develop new operating methods.

**5. Biodiversity is maintained**

Human activities have an impact on the balance of nature. Biological diversity enables nature to adjust to changes caused by man, up to a certain point. This is why maintaining nature's diversity is necessary. Land use planning, conserving natural resources and recycling are key components in maintaining biodiversity.

**6. CO<sub>2</sub> emissions are reduced**

Carbon dioxide is a major greenhouse gas. Reducing these emissions have a key role in climatic change and how the environment will alter. The aim is, that CO<sub>2</sub> emissions will not increase above the 1990 level.

**7. The quality of residential environment is protected**

The quality of the residential environment affects human health. The City must take care of maintaining and improving the quality of this environment in its activities. The focus is on living conditions, pleasant surroundings, noise control, water and air quality and preventing health hazards from the food supply.

*(From: <http://www.tampere.fi/ytoteto/yva/eng/engympol/engympol.htm#alku>)*

# Annex B

## Environmental Policy

### *City of Newcastle, Australia*

Newcastle City Council is committed to achieving our community's environmental goal to become an ecologically sustainable City and will in all of our services seek to lead by example and establish standards of environmental excellence. Council's policy is to:

#### **1. Commitment**

Incorporate our environmental management responsibilities into every aspect of our work.

#### **2. Standards**

Establish and implement best practice environmental performance with standards of excellence, which meet or exceed regulatory requirements in support of the principles of ecological sustainability, and encourage our suppliers and contractors to achieve those same standards.

#### **3. Continual Improvement**

Regularly measure, audit and review our environmental performance to ensure the organization's ongoing improvement.

#### **4. Communication**

Communicate frankly with our community on issues related to our organization's environmental performance and regularly seek community input.

#### **5. Employees**

Provide the leadership and training so that our employees can implement this policy, and continue to build the capacity of the organization to achieve continual environmental improvement.

#### **6. Community Leadership**

Work to develop and promote services and technologies, which are ecologically and economically sustainable, and encourage others to do the same.

#### **7. Resource Efficiency**

Pursue and implement effective ways of minimizing waste and ensure efficient and sustainable use of energy and natural resources.

## **8. Pollution Prevention**

Seek to prevent pollution and manage our wastes in ways to safeguard the community, workplace and environment.

Janet Dore  
General Manager  
August 1999

*(From: <http://newcastle.infohunt.nsw.gov.au/environ/envpol/envpol.html>)*

# Annex C

## **Environmental Policy**

*SEDAPAL<sup>1</sup>, Lima, Peru*

“We declare our permanent commitment to contribute towards the sustainable development of the cities of Lima and Callao, providing efficient drinking water and wastewater treatment services, taking a cautionary approach and making responsible use of natural resources, based on principles of continual improvement of our environmental performance, prevention of pollution and respect for applicable environmental law.”

*December 7, 1999*

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1. SEDAPAL is the Peruvian government agency responsible for providing drinking water and wastewater treatment for metropolitan Lima.



# Annex D

## Case Studies of Local Government Initiatives To Introduce ISO 14000 Environmental Management Systems

This annex summarizes three local government efforts to apply Environmental Management System (EMS) concepts to the management and delivery of basic urban services.

These three case studies are drawn from a small set of local governments in the US that have been engaged in pioneering efforts to establish EMS in conformity with ISO 14000 at the municipal level. The initiatives took place within a US Environmental Protection Agency sponsored program with technical assistance provided by the Global Environment and Technology Foundation.

Each pilot EMS program has begun to demonstrate the potential for EMS both to improve the effectiveness of overall management and communication within key municipal agencies and to deliver concrete results in respect to cost savings and environmental mitigation. The pilot projects are in:

- (1) The City of Lowell, Massachusetts, which selected its wastewater utility for the pilot EMS initiative. Results include a reduction of solid waste deliveries to the city landfill.
- (2) The City of Gaithersberg, Maryland, where the EMS was developed for the City's Department of Public Works. Although not as far ahead in implementation as the Lowell EMS, the Gaithersburg initiative holds promise for combining cost savings with positive environmental benefits in respect to both (i) solid and hazardous waste generation, and (ii) reduced energy consumption.
- (3) The Town of Londonderry, which, like the Gaithersburg EMS pilot, centers on its Public Works Department. Londonderry's effort provides an instructive example of a small community, less than 25,000 in population (and one that contracts out many of its basic services), introducing sophisticated EMS concepts. In addition to improved operating procedures in its solid waste and sewer divisions, the Town's EMS targeted its highway garage facility that services and houses the Municipality's fleet of vehicles.

The narrative reflects the status of the three respective projects as of mid to late 1999.

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## **CITY OF LOWELL, MASSACHUSETTS<sup>1</sup>**

### **Brief Description of the Municipality**

The City of Lowell is situated in northeastern Massachusetts, 25 miles from Boston, a short distance from the Route 128, Boston Beltway (“America’s Technology Highway.”). As such, the City finds itself well positioned in the center of the leading manufacturing region in Massachusetts. Like many New England communities, Lowell lost much of its textile manufacturing base during the post-World War II era and has sought to diversify its economic base in recent years with some success. Manufacturing represents 32% of the jobs in the area with the majority found in the fields of plastics, high technology and medical technology. Based on the 1990 Census, Lowell has a population of 103,440 and occupies a land area of 13.4 square miles.

Lowell was incorporated as a township in 1826 and was later incorporated as a city in 1836. The City is governed by a nine-member elected City Council and a City Manager who is appointed by the Council. The Mayor is elected by the members of the City Council and serves as its presiding officer.

### **“Fence-line” Data**

As its fence-line, Lowell chose the Lowell Wastewater Utility for this pilot project in large part because environmental enhancement is integral to the Utility’s mission. It is an activated Sludge Wastewater Treatment Facility with a design flow of 32 million gallons a day (mgd) and an actual, average flow of 31 mgd. In 1998, the Facility produced approximately 23,540 tons of quality biosolid for land application or composting. Some of its environmental impacts include: odor, air emissions, noise pollution, soil and water contamination from chemical leaks, energy consumption, resource recycling, and effluent quality.

The Utility provides primary and secondary treatment to more than 170,000 users located in five communities, Lowell included. The system operates through 230 miles of sewer lines, 5000 catch basins, and the same number of manholes. The Utility is staffed with 46 employees.

### **The Core Team**

The management leads for this EMS project are the Assistant City Manager and the Executive Director of Lowell Regional Wastewater Utility.

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<sup>2</sup> This Lowell case study and the following case studies for Gaithersburg and Londonderry, have been adapted, with some modifications, from material provided by Global Environment & Technology Foundation for use in the USAID sponsored training on Application of ISO 14000 Environmental Management Systems (EMS) for Municipalities organized by IIE. As such, it is used with GETF’s permission and in conjunction with requirements under the EPA ISO 14000 EMS Municipalities Project. The case documentation was compiled by GETF from material provided to them by the participating communities themselves and does not reflect the results of any independent, outside assessment.

Prior to project initiation, the Utility posted information concerning the ISO 14001 standard and environmental management systems (EMSs) throughout its Facilities. Once all staff had had a reasonable opportunity to read the information, a memo was posted asking for volunteers willing to participate in an ISO 14001 Implementation Team. Thirteen employees volunteered, one of which was from management.

The core team consists of:

Executive Director  
Maintenance Division – 4 employees  
Operations Division – 2 employees  
Engineering/Pretreatment Division – 2 employees  
Laboratory – 1 employee

During the course of the project, the original 13-member core team lost 3 members due to their departure for new positions. The Core Team currently consists of 10 members.

### **Why an EMS: Drivers**

The City of Lowell believes the EMS will:

- Enhance the city’s overall image;
- Improve its environmental performance;
- Help lead the region’s private sector toward compliance with the ISO standards through education, training and awareness; and,
- Maximize efficiency, reduce costs and avoid costly environmental emergencies, thereby saving taxpayers money.

### **Objectives and Targets**

Initially, each division within the Utility was asked to identify the objectives and targets specific to its role within the organization. Objectives and targets were identified for Operations, Maintenance, Engineering/Pretreatment, Laboratory and Administration. Once this task was completed, the Implementation Team identified the objectives and targets of each division with the greatest impact on the environment.

The areas the team identified were:

- Landfill/Waste Management;
- Chemical Management;
- Odors;
- Energy Usage; and,
- Industrial Waste Stream Notification.

This process then led to the development of targets for each program that was developed.

## Status of the EMS

The following are the five major programs identified for the EMS:

1. Waste Stream Management
2. Chemical Use Management
3. Energy Reduction
4. Odor Control
5. Industrial Notification

The EMS Implementation Team conducted Utility-wide training and performed an in-house audit on the EMS policy and the Waste Stream Management and Chemical Use Management programs.

The core team will complete final Utility-wide training and then perform an audit of the remaining programs (Energy Reduction, Odor Control and Industrial Notification). After this is completed, the Core Team will prepare for an external audit of the program. The City anticipates conducting a complete Utility-wide audit of the EMS in January 2000.

The Waste Stream Management Program was implemented in April 1999. As a result, the Utility has recorded an increase in the amount of recyclable material collected and a decrease in the amount of material disposed of at the landfill.

Recyclable materials collected (April 1999 – June 1999):

• Pounds of Paper	1,853
• Pounds of Cardboard	4,000
• Pound of Co-mingled	319
• Pounds of Batteries	79
• Pounds of Broken Mercury Vapor Lamps	16
• Pounds of Lamp Ballasts	430
• Feet of Mercury Vapor Lamps	2060

During this three-month period, the program reduced the waste stream load to the landfill by about four tons and saved the Utility over \$300.00. Through preliminary energy reduction strategies, the Utility has seen energy savings of \$7,400 over a 10-month period.

## Keys to Success

1. The City views the key factor in the EMS effort as the direct effort to engage the support of both senior leadership within the general purpose, local government and of management and lead staff within the Wastewater Utility itself.
2. City workers also attribute the use of an outside consultant to project success. The consultant assisted the EMS team with document control and the development of the EMS

manual, and will also help with preparing the Utility for formal certification pursuant to ISO 14001.

## **Obstacles**

The following obstacles were encountered during the development of the EMS:

- **Time constraint:** The process proved more time-consuming than anticipated, in particular the effort required to educate and train employees in ISO 14001 fundamentals.
- **Monetary constraint:** Funds had to be allocated for necessary consultant services and for the certification process itself. In-kind contributions by members of the community, however, proved to be a significant resource for the EMS effort.
- **Staff turnover:** The EMS Core Team suffered a loss in key staff members involved in the documentation process, which ultimately cost a significant amount of time developing the Environmental Management System.
- **Weak community interest:** The EMS effort received some support from the City Council and the local media channels but support was lacking from the community as a whole. Municipal Council support was demonstrated by funding the ISO trips and presentations, and local media provided positive reporting on the project. However, the EMS, perhaps due to the absence of controversial issues, did not arouse much excitement within the public at large.

## **Benefits**

- **Improved communication:** The City reported improved communication at all levels, among plant divisions, from staff members to the Department Head and Executive Director, and on all levels of the administration including the City Manager's Office. The increased communication contributed to more efficient operations at the wastewater Facility itself, and to increased top management awareness of the issues affecting the success of various departments in meeting their missions.
- **Shared decision making:** The Core Team developed a strong, group relationship which improved operations through risk taking and improved communications.
- **Employee empowerment:** Employees, for the first time, received a larger, strategy-oriented view of the Utility, and their respective departments, within the City administrative structure and in their potential to impact operations.
- **Increased efficiency:** Reducing the material waste sent to the landfill resulted in cost savings, while improved permit review resulted in increased efficiencies. Other EMS components will contribute to better customer service.

## Lessons Learned

1. Bring on a consultant early in the process. In retrospect, it would have been helpful to hire the consultant in the early stages of implementation, to assist with the training of the Core Team and members of the Utility. City staff attempted to educate and train themselves in the ISO 14001 standard; a process that, as noted above, proved to be a time sink. A trained outside professional could have accomplished the same result much more expeditiously. In Lowell, the consultant was not retained until the EMS process had been underway for a year and half.
2. City of Lowell staff and officials concluded that, if they were to start over, they would have included an additional Facility within their “fenceline”. At this point, they are examining the possibility of developing an EMS for another City Department. The two-year project involved a long and relatively complex process. Including another Facility in the training and education phase would have eliminated subsequent duplication of efforts.
3. The Core Team encountered difficulty with some technical aspects of the project, specifically, the development of metrics. They lacked quantitative documentation for municipal “production”. This in turn hindered their ability to develop a baseline analysis of past performance.

## Contact Information

Mark Young  
Executive Director  
Lowell Regional Wastewater Utility

James Smith  
Assistant City Manager  
City of Lowell

## Total Cost/Resource Commitment During This Project

Labor	Consultant	Travel	Materials
\$27,100	\$10,500	\$3,100	\$1,700

## Future EMS Plans

The City of Lowell remains committed to obtaining certification of its Wastewater Treatment Facility as an ISO 14001 compliant entity. The City is also examining the possibility of developing and implementing an ISO 14001 system within its Department of Public Works and eventually at other City Departments.

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## **CITY OF GAITHERSBURG, MARYLAND**

### **Brief Description of the Municipality**

The City of Gaithersburg is located along the I-270 high technology corridor in the heart of Montgomery County, Maryland. The southeastern border of the City lies 12 miles from Washington, D.C. The City of Gaithersburg occupies 9.93 square miles, with an estimated 1999 population of 49,500 people and per capita income, based on the 1990 Census, of \$18,845. The City is host to more than 2,000 businesses and is one of the three centers for biotech industry in the United States. In addition, the National Institutes of Standards and Technology (NIST) headquarters is located in Gaithersburg.

Gaithersburg became an incorporated town in 1878 and was elevated to city status in 1968. The City operates under the council-manager form of municipal government, with the City Manager appointed by the City Council. The Mayor and City Council are elected to staggered, four-year terms and the Mayor serves as Council President.

### **“Fenceline” Data**

Gaithersburg chose its Public Works, Parks Maintenance & Engineering Administration Department as the fenceline for the USEPA pilot project. The activities and services provided by this Department have the greatest impact on the environment as compared to other City departments. The potential impacts include air emissions, potential spills and accidental releases, hazardous material storage, energy consumption, road salt usage and storage, and storm water discharges. Since the Department provides some of the services valued most by the citizens, the City felt that implementing an Environmental Management System (EMS) for this Department would help improve operating efficiency, thus improving service delivery to its customers.

This department provides a variety of services including:

- Snow removal;
- Street sweeping;
- Storm water management and maintenance of storm water infrastructure;
- Repair and maintenance of streets and sidewalks;
- Beautification of the City’s streets, public buildings and parks;
- Curbside recycling;
- Recycling drop-off for used oil, used antifreeze, mixed paper, aluminum, and metal cans;
- Maintenance for all City Facilities;
- Construction and capital improvements for all City-owned buildings and Facilities; and,
- Fleet and equipment maintenance.

The Department also reviews storm water management and sediment control plans, street

locations and configurations, traffic routing, lighting, paving, and site plans for proposed commercial and residential developments. The Department's engineering staff administers capital improvement projects for road and storm drain projects.

The Department operates with a staff of over 60 full-time employees, and at times, 20 part-time and 4 contract employees. The Department of Public Works has a budget of \$6.6 million for fiscal year 2000, including labor, overhead costs and capital improvements.

### **The Core Team**

Management leads for the EMS project were the City Manager and Deputy City Manager.

Gaithersburg appointed a ten person Core Team to plan, develop and implement the EMS for the Department of Public Works. The EMS Project Manager was the Assistant to the City Manager. The Core Team consisted of the following personnel:

- Assistant to the City Manager
- Director of Public Works
- Superintendent of Public Works
- Environmental Specialist
- Engineering Technician
- Team Leaders from the 5 functional areas (fleet maintenance, beautification and landscaping, parks maintenance, street maintenance, and recycling/mowing)

### **Why an EMS: Drivers**

A major impetus for developing an EMS in the City of Gaithersburg's Department of Public Works originated from the City's volunteer Environmental Affairs Committee. In particular, one member believed that in conjunction with the City's new environmental standards, the development of an EMS would help project an image of the City as a leader in environmental protection.

Gaithersburg believed that the EMS would:

- Help the City perform a more thorough and accurate job of monitoring and controlling the environmental impact of the services provided to residents;
- Increase the efficiency and productivity of Public Works' operations, while meeting all environmental obligations;
- Increase employee and citizen environmental awareness, thus improving the work environment for employees and the quality of life for citizens;
- Help attract new businesses;
- Identify areas for continuing improvement through measuring and monitoring.

## Objective and Targets

The City of Gaithersburg conducted a thorough analysis of the real and potential environmental impacts from the significant activities performed by the Department of Public Works. In conjunction with a review of the legal requirements for all the activities, services, and products provided by the Department, the Core Team developed the following list of Objectives and Targets.

Objective	Target
Reduce oil, grease, and other pollutants entering storm sewer system.	<ul style="list-style-type: none"> <li>• Use indoor wash areas as much as possible.</li> <li>• Install oil/grit separator between storm drain inlet and outlet to stream</li> <li>• Construct new wash bay for equipment and vehicles.</li> </ul>
Eliminate the need to dispose of hazardous waste generated by parts washer.	<ul style="list-style-type: none"> <li>• Acquire new parts washer that separates oil and grease and recycles water.</li> </ul>
Reduce oily debris in waste stream.	<ul style="list-style-type: none"> <li>• Use vendor to pickup and clean oily rags.</li> </ul>
Eliminate the potential for battery acid to enter the storm sewer system.	<ul style="list-style-type: none"> <li>• Store abandoned batteries indoors.</li> <li>• Purchase containment structure to capture and contain any potential releases from abandoned batteries.</li> </ul>
Control algae in ponds.	<ul style="list-style-type: none"> <li>• Assess the potential to reduce alga growth by aeration and barley bales.</li> </ul>
Assess soil conditions and fertilizer needs of grass on city property.	<ul style="list-style-type: none"> <li>• Have soil samples taken and analyzed for nutrients and the need for future fertilizing.</li> </ul>
Reduce amount of salt applied to City streets.	<ul style="list-style-type: none"> <li>• Calibrate salt trucks.</li> <li>• Acquire ground sensors to monitor truck speed.</li> <li>• Purchase and use "Ice Ban".</li> <li>• Explore the possibility of mixing ash and salt.</li> </ul>
Reduce air emissions	<ul style="list-style-type: none"> <li>• Emission testing for diesel trucks.</li> <li>• Explore the potential of using alternative fuel vehicles.</li> </ul>
Environmental awareness training	<ul style="list-style-type: none"> <li>• Conduct environmental awareness training for all Department employees.</li> </ul>
UST compliance	<ul style="list-style-type: none"> <li>• Review tank size requirements and conditions of tanks to ensure compliance with State UST regulations.</li> </ul>
Emergency Response Plan	<ul style="list-style-type: none"> <li>• Develop, or update, plan.</li> </ul>
Storm water pollution prevention plan	<ul style="list-style-type: none"> <li>• Develop and implement SWPPP.</li> </ul>

## **Status of the EMS**

In July 1999, the City of Gaithersburg produced a "working draft" of the EMS Manual and environmental procedures for:

- Identification of Aspects and Impacts;
- Tracking of Legal and Other Requirements;
- Setting and Tracking Objectives and Targets;
- Employee Training and Environmental Awareness;
- Internal Communications;
- External Communications;
- Document Control;
- Document Changes;
- Emergency Preparedness and Response;
- Preventive and Corrective Action;
- Audits; and,
- Management Review.

The status of each procedure varies. Many of the procedures have been implemented, yet others remain as drafts. Implementation of the draft items requires training appropriate employees in specific activities, such as conducting audits.

Further, the City of Gaithersburg developed and implemented environmental programs for each of the objectives and targets identified earlier.

## **Keys to Success**

The members of the Core Team contributed to the progress made by the Environmental Management System effort. The Core Team was carefully designed to include representatives from the City Manager's Office and the Department of Public Works. By including the Director and Superintendent of the Department of Public Works, the project benefited from the participation of the two players most responsible for the Department's budget, planning and oversight of its capital improvement projects.

Moreover, from the beginning, the project received support from the City Manager and Deputy City Manager. They managed political interference, ensured cooperation from other City departments, and made funds available for retaining a qualified professional to champion the project.

The final key ingredient was the creation of an Environmental Specialist position, filled by someone qualified to lead the planning, development, and implementation of the EMS. This person brought the specialized expertise in both EMS planning and compliance audits that had previously been lacking.

## Obstacles

The City of Gaithersburg has faced a number of obstacles in developing and implementing the environmental management system. These include:

- Identifying legal requirements;
- Introducing the project to employees;
- Conducting a useful gap analysis;
- Developing a baseline;
- Developing a documentation plan;
- Implementing documentation in areas where it may not have been required in the past; and,
- Absence of standardized work procedures.

## Benefits

Although the City of Gaithersburg had not fully implemented the EMS at the time this document was prepared, it had already realized some tangible benefits from the process. Once completed and implemented, the City expects to realize the following range of benefits:

- Greater operational efficiency;
- Increased employee awareness regarding environmental and safety issues;
- Reduced solid and hazardous waste generation;
- Cost savings from reduced disposal costs;
- Reduced energy use;
- Cost savings from reduced energy use;
- An environmental baseline from which all future activities may be measured;
- Ease in transferring of work roles or replacement of existing employees;
- Keeping current with legal and regulatory changes;
- Identification of potential problem areas that were previously overlooked or viewed as non-consequential; and
- Empowering all employees to raise environmental concerns.

## Lessons Learned

Based on its experience to date and if given a second chance to start the project, the City of Gaithersburg would have approached the development and implementation of the EMS differently. The lessons learned over the life of the pilot project include:

- The Core Team remained the strength of the City's EMS. It incorporated personnel from the City Manager's Office and the Department of Public Works.
- The inclusion of Department of Public Works management as members of the Core Team was critical. It enabled quick decisions on capital expenditures and knowledge of potential future capital improvements for budget discussions.
- Familiarity with environmental management systems and environmental compliance was necessary at the beginning of the project.

- The EMS required a strong, internal leader, dedicated to the planning, development and implementation of the EMS.

### Contact Information

For more information contact:  
 Mark Pfefferle (301) 258-6310  
 mpfefferle@ci.gaithersburg.md.us.

### Total Cost/Resource Commitment During This Project

The table below shows the dollar amount spent by the City of Gaithersburg from August 1997 through July 1999 in planning, developing, and implementing the City's EMS. Travel costs represent costs for City of Gaithersburg personnel to attend meetings and workshops hosted by the U.S. Environmental Protection Agency during the pilot program. All figures are in nominal dollars.

Labor	Consultant	Travel	Materials
\$22,000	\$0	\$4,600	\$800

### Future EMS Plans

Once the EMS is completed and fully implemented, the decision to seek certification with the ISO 14001 standard will depend on guidance from the Mayor and Council. The Core Team intended to complete and implement the EMS by January 2000. If the Mayor and Council decide to pursue certification, it will be sought during calendar year 2000.

## **TOWN OF LONDONERRY, NEW HAMPSHIRE**

### **Brief Description of the Municipality**

In 1998, Londonderry had a total population of approximately 23,000 and has an annual growth rate of 4 to 5 percent. The Town is located sixty miles north of Boston in the southeast corner of New Hampshire. Its proximity to the technology highway of Boston has enabled it to become one of the fastest growing communities in the state. The town has experienced a 45% increase in its population from 1980 to 1990.

This rapid growth prompted the Town to develop a Master Plan to ensure that its historical, small town atmosphere is preserved. This plan includes maintaining open spaces, expanding recreational facilities, managing future growth and supporting business development to stabilize the tax base. The town government consists of a Town Council with five elected officers, and a Town Manager that administers the Town's operations, services and contracts.

Londonderry's five commercial apple orchards, Woodmont, Sunnycrest, Elwood, Moose Hill, and Merrills, help define the community's special character. The apple growers not only contribute to the local economy, but also provide valuable open spaces. Londonderry's *Apple Way*, is a designated *New Hampshire Scenic and Cultural Byway*, which winds past orchards, old farmhouses and local landmarks.

Londonderry has adopted a Sustainable Development Program to encourage economic growth while maintaining the rural quality of life in the community. The Program features the Londonderry Eco-Park, which is one of only 20 Ecological Industrial Parks in the country. Londonderry's efforts are paying off with a cleaner environment, a protected rural lifestyle, and recognition from federal and state government, including receipt of the first ever State of New Hampshire Municipal Pollution Prevention Award.

### **"Fenceline" Data**

Londonderry chose its Public Works Department as its fenceline. The Public Works Department was chosen over the other departments because of its immediate environmental impact. The Department consists of the divisions of Solid Waste, Sewer, Highway, and Engineering. The Solid Waste Division employs a supervisor and one Solid Waste operator for the Drop Off Center. The Sewer Division consists of one superintendent. The Engineering Division has a Town Engineer, who also acts as the Public Works Director, and one junior engineer as staff. The Highway Division has the largest number of employees with 8 full-time and one foreman. The total number of employees in the Public Works Department is 15, including one for administrative duties.

Because of its small size, Londonderry contracts out many of its services. It procures wastewater treatment services from neighboring Town of Derry and City of Manchester. It also contracts with a private hauler for its curbside trash and recycling collections. The town does not maintain its own transfer station, but it does provide a Drop Off Center, which accepts limited materials.

The Highway Garage maintains the roads for the Town and possesses some heavy grade construction vehicles along with trucks used to salt and sand the roads during the winter. Large road projects are contracted out. The Town Engineer reviews and inspects development plans.

### **The Core Team**

The lead management for this EMS project included the Public Works Director/Town Engineer, Town Manager, and the Division Supervisors of Sewer & Solid Waste. The five Town Councilors are committed to the project and kept informed of progress, but are not directly involved in its development

Due to the Town government's small size and limited resources, three representatives were deemed adequate to complete the project. The Core Team initially was composed of the Solid Waste Supervisor (Project Director), Administrative Services Director (Environmental Management Representative) and the Planning and Economic Director. The Public Works Director replaced the Planner half way through the project.

### **Why an EMS: Drivers**

Londonderry contains three Superfund sites, including a landfill, which was closed in the late 1970s. These environmentally degraded sites demonstrate the potential consequences of major public facility construction and operation. Londonderry hopes its EMS will:

- Reduce adverse environmental impact from Town operations;
- Improve its image as a healthy and safe community; and,
- Increase efficiency and lower risk and liability.

### **Objectives and Targets**

The Public Works Department developed the following objectives and targets for its divisions.

#### The Solid Waste Division:

- To decrease in the volume of solid waste through education efforts, raising waste and recycling awareness among residents, and diverting more materials from the curbside to the Londonderry Drop Off Center, and
- To decrease the toxicity of the waste stream through use of Household Hazardous Waste Days and Waste Oil Collections.

The Highway Garage objective is to improve materials management through operational controls at the garage, eliminating disposable materials, promoting non-toxics, and ensuring safe storage and disposal of hazardous materials.

The Sewer Division objective is to improve wastewater quality through improved education and promotion of the pretreatment program. All of the divisions have embraced the objective to ensure that proper health & safety measures are implemented as needed for compliance.

## Status of the EMS

As of printing, Londonderry's EMS was seventy-five percent complete. The Londonderry DPW adopted an Environmental Policy, developed roles and responsibilities of all those involved and completed documentation of its legal requirements. The environmental aspects and impacts of each division have been identified, and a list of significant environmental aspects produced. From these, objectives and targets were established and a set of Environmental Management Programs developed.

The Town completed its first internal audit and is working on procedures for checking and corrective action and management review.

## Keys to Success

The two keys to success for Londonderry were: 1) having a group of motivated Core Team members to maintain the enthusiasm and momentum for the project and 2) having a temporary, external project assistant (from Antioch College in Keene, NH) to help with development and implementation. The latter proved extremely beneficial since Londonderry is a small community with limited resources, and initial was understaffing of the EMS effort.

## Obstacles

- The Core Team experienced some difficulties maintaining the projected schedule for EMS development and implementation, allocating the work load involved, and developing the required documentation. Regular meetings helped with scheduling; however, with additional tracking and metrics requirements, the work load became difficult to sustain and the schedule was lengthened.
- The Core Team encountered some questions about the merits and feasibility of “spending money to save money” in the interest of environmental enhancement. Should EMS implementation involve up-front costs for the purchase of equipment or materials? If so, where would the funding be found? To convince the Town Council of the necessary investments, the Core Team focused on estimating the recovery of these investments through operating cost savings (e.g. through reduced hazardous waste disposal costs). They also tried to document the economic benefits of being ISO 14001 compliant.

## Benefits

- The greatest benefit from this program was in defining roles and responsibilities according to legal requirements. The EMS planning process clarified the respective organizational role of each division supervisor. As part of the EMS, the Core Team, working with each division, developed a consolidated list of pertinent legal requirements.
- Identifying responsibility for compliance issues.
- Better communication among divisions.
- Documentation of procedures and work instructions provided *consistent and reliable*

methods for dealing with environmental aspects.

- Identification of goals to lessen the environmental impact of the town's activities. This aspect provided support during the budget process when justification for services and activities was required.
- Improved safety for workers by implementing pollution prevention techniques and providing hazardous awareness training.
- Better management practices resulting in decreased water usage. The Highway Garage evaluated the use of high-pressure low volume nozzles and other pollution prevention techniques to reduce water usage (and lower costs at the same time).

### **Lessons Learned**

From the project's inception, it was essential to involve all key individuals and organizations (within government and from the outside as well). The Londonderry group advises any local government initiating an EMS to identify, early in the process, community-based, environmental initiatives under the sponsorship of local NGOs, and to integrate and build on such local initiatives in the EMS process.

### **Contact Information**

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Londonderry, NH 03053

### **Future EMS Plans**

Londonderry plans to finalize its environmental management programs and to seek third party registration. Registration was anticipated by late-2000, at the earliest, since the necessary funding approval must pass through the Town budget process. However, the possibility of expanding the program to include other departments in the town was mentioned in a recent progress report on the EMS to the Town Council. The Fire Department, Police Dept., Recreation Dept. and possibly even the public schools were cited as possibilities. As of September 1999, the Councilors were pleased with the project and the benefits it has provided, believing that it contributed to an improved bond rating for the Town.

# Resources

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## **Additional Information and Assistance**

There are many resources available to help your organization develop and implement an EMS that are free of charge or relatively inexpensive. The following is a description of some of these resources.

### **Federal Government Agencies**

The U.S. **Environmental Protection Agency** (USEPA) provides information on a number of topics that can be useful in the development and implementation of an EMS. Some of these resources include: assistance with interpretation of environmental laws and regulations; information on pollution prevention technologies (case studies and fact sheets); and hotlines to answer questions about environmental issues. The Agency also has web sites for information on EMS's and Design for Environment. The USEPA's Office of Compliance has established national Compliance Assistance Centers for various industry sectors.

The **Small Business Administration** (SBA) provides assistance to small and medium-sized organizations. The SBA can provide information and assistance related to: operation and management of a business; sources of financial assistance; international trade; as well as laws and regulations.

### **State Agencies**

Your state environmental regulatory agency can provide assistance with the development of an EMS. Contact your state environmental agency and inquire about education and outreach programs for organizations that are developing an EMS. Many state environmental agencies also can provide publications, pamphlets, and on-line help related to state environmental laws, innovative pollution prevention technologies, waste reduction, and permitting. Some states (such as North Carolina, Wisconsin and Virginia) have developed programs to help organizations implement an EMS and/or seek ISO 14001 registration. Recently, several states (including Texas and Virginia) established "EnviroMentor" programs within their Small Business Assistance Offices. These mentoring programs are intended to help small companies comply with regulations.

### **Associations**

Industry trade associations can provide assistance with the development of an EMS. These organizations can provide information on industry-specific environmental management issues, and can put you in contact with other organizations that can share their experience and expertise in EMS implementation.

### **Colleges and Universities**

Some colleges and universities provide EMS-related training or manage EMS demonstration projects.

## **Chambers of Commerce**

Your local or state chamber of commerce might be helpful in providing information about legislative and regulatory issues that affect environmental management for small and medium-sized organizations. Other services that are commonly offered include handbooks, workshops, conferences and seminars.

## **Non-Profit Organizations**

Another resource to consider is the Manufacturing Extension Partnership (MEP), which is a growing nationwide system of services that provide technical support to businesses interested in assessing and improving their current manufacturing processes. The MEP is a partnership of local manufacturing extension centers which typically involve federal, state, and local governments, educational institutions, and other sources of information and funding support. The MEP can also often provide assistance with quality management, development of training programs and business systems.

The Industrial Technology Institute (ITI) is a non-profit organization dedicated to expanding technology access and technology management among U.S. manufacturers. ITI provides technical assistance to small and medium-sized organizations through the Michigan Manufacturing Technology Center. ITI also has experience with the development of business performance tools and provides services for energy, environment, and manufacturing assessments; as well as, QS 9000 and ISO 14000 training and implementation.

## **Other Organizations**

Another recommended source of information and expertise is the organizations with which you do business. It is likely that your suppliers and customers have experience with many of the aspects of an EMS, and might be willing to share their experiences and provide advice to your organization.

## **On-line Resources**

There is a wealth of information related to EMS implementation available electronically via the Internet. Many state, federal, and local agencies have home pages on the Internet containing information that can be useful to your organization. Numerous non-governmental organizations have home pages that contain information on topics such as ISO 14000, pollution prevention, recycling and waste minimization, environmental laws and regulations, innovative manufacturing technologies, and materials substitution. If your organization does not have Internet access, contact your local library to see if it provides Internet access to users.

## INTERNET RESOURCES

Resource	Internet Address	Description
ANSI Online	<a href="http://www.ansi.org">http://www.ansi.org</a>	Contains information related to the American National Standards Institute, including meetings, events, and standards information databases.
Business Resource Center	<a href="http://www.kciLink.com/brc">http://www.kciLink.com/brc</a>	Provides information on a variety of topics, including tips on management, recycling, and financing.
Canadian Standards Association	<a href="http://www.csa.ca/isotcs">http://www.csa.ca/isotcs</a>	A center for information and services related to ISO 9000 and ISO 14000, maintained by the Canadian Standards Association.
Clean Technologies Center (UCLA)	<a href="http://cct.seas.ucla.edu">http://cct.seas.ucla.edu</a>	Innovative technologies for pollution prevention.
Consortium on Green Design and Manufacturing (UC-Berkeley)	<a href="http://euler.berkeley.edu/green/cgdm.html">http://euler.berkeley.edu/green/cgdm.html</a>	Environmental design and sustainable development.
Environmental Technology Gateway	<a href="http://iridium.nttc.edu/environmental.html">http://iridium.nttc.edu/environmental.html</a>	Access to other environmental links and information, environmental technologies.
International Corporate Environmental Reporting Site	<a href="http://www.enviroreporting.com">www.enviroreporting.com</a>	International news about environmental issues and resources for environmental reporting.
Industrial Technology Institute Home Page	<a href="http://www.iti.org">http://www.iti.org</a>	Information about ITI, how to find environmental information on the Internet, and links to other organizations.

## INTERNET RESOURCES

Resource	Internet Address	Description
International Network for Environmental Management	<a href="http://www.inem.org">www.inem.org</a>	Case studies, publications and how-to information on environmental management. Interactive tools for assessing environmental policies and reports.
ISO 14000 Information Center	<a href="http://www.iso14000.com">http://www.iso14000.com</a>	Answers to questions on ISO 14000 standards.
ISO 14000 Integrated Solutions (ANSI/GETF)	<a href="http://www.gnet.org">http://www.gnet.org</a>	Will provide training, conferencing, on-line information services and publications on a fee basis.
ISO Online	<a href="http://www.iso.ch">http://www.iso.ch</a>	The ISO homepage provides information on ISO, its structure, members, technical committees, meetings, and events.
Multi-State Working Group	<a href="http://www.mswg.org">www.mswg.org</a>	Describes the activities of this group regarding EMS and ISO 14001.
National Environmental Information Resources Center (NEIRC)	<a href="http://www.gwu.edu/~greenu/">http://www.gwu.edu/~greenu/</a>	Provides access to a wide variety of information about environmental matters, with links to hundreds of organizations.
NSF-ISR Home Page	<a href="http://www.nsf-isr.org">http://www.nsf-isr.org</a>	Contains information on NSF International and its pilot projects in EMS implementation.

**AUTHORIZED SOURCES OF THE ISO 14000 STANDARDS**

<b>Resource</b>	<b>Telephone and Fax</b>	<b>Description</b>
NSF International (NSF)	Phone: 1-888-NSF-9000 Fax: 1-734-827-6801	789 N. Dixboro Road Ann Arbor, MI 48105
American National Standards Institute (ANSI)	Phone: 1-212-642-4900 Fax: 1-212-398-0023	11 West 42 <sup>nd</sup> Street New York, NY 10036
American Society for Quality (ASQ)	Phone: 1-414-272-8575 Fax: 1-414-272-1734	Milwaukee, WI
American Society for Testing and Materials (ASTM)	Phone: 1-610-832-9585 Fax: 1-610-832-9555	West Conshohocken, PA

## Additional Sources of Information and Contacts

### FEDERAL AGENCIES

Organization	Resource	Telephone Number / Internet Address	Description
<b>US Environmental Protection Agency</b>	Small Business Compliance Assistance Centers:	202/564-7066 (general information)	Centers are Internet Web Sites with comprehensive environmental compliance, technical assistance, & pollution prevention information for various industry sectors.
	Design for Environment Guide, Fact Sheets and DFE EMS Template	<a href="http://www.epa.gov/opptintr/dfe/tools/ems/ems.html">www.epa.gov/opptintr/dfe/tools/ems/ems.html</a>	Website contains information on EMS and how to incorporate DFE into an EMS. Provides a how-to manual for implementing a DFE-based EMS and a set of integration tools for companies that already have an EMS.
	Small Business Compliance Policy	202/564-7072 <a href="http://www.epa.gov/oeca/smbusi.html">www.epa.gov/oeca/smbusi.html</a>	Effective May 11, 2000, this policy supercedes the June 1996 version. Published in the Federal Register on April 11, 2000 (65FR19630).
	Compliance-Focused EMS – Enforcement Agreement Guidance	<a href="http://es.epa.gov/oeca/oceft/neic/12elemnr.pdf">http://es.epa.gov/oeca/oceft/neic/12elemnr.pdf</a>	Presents the key elements of a compliance focused EMS model.
	Environmental Compliance Auditing Protocols	EPA National Service Center 1-800-490-9198 <a href="http://www.epa.gov/oeca/ccsmd/profile.html">www.epa.gov/oeca/ccsmd/profile.html</a>	These protocols are intended to guide regulated entities in the conduct of compliance audits and to ensure that audits are conducted in a thorough manner.
	Code of Environmental Management Principles	<a href="http://www.epa.gov/oeca/cemp/cemptoc.html">www.epa.gov/oeca/cemp/cemptoc.html</a>	Collection of five broad principles and performance objectives that provide a basis for environmental management among Federal agencies.

## FEDERAL AGENCIES

Organization	Resource	Telephone Number / Internet Address	Description
<b>US Environmental Protection Agency (cont'd)</b>			
	Pollution Prevention Clearinghouse	202/260-1023	Technical Information on materials and processes, including publications related to waste minimization and pollution prevention.
	Office of Wastewater Management	<a href="http://www.epa.gov/owwm/iso2/htm">www.epa.gov/owwm/iso2/htm</a>	Provides information on various EPA-sponsored EMS projects.
	Public Information Center	202/260-7751	General information about EPA programs.
	RCRA / Superfund Hotline	800/424-9346 202/382-3000	Provides information about hazardous waste regulations and handles requests for federal documents and laws.
	Small Business and Asbestos Ombudsman	800/368-5888 202/557-1938	Information and advice on compliance issues for small quantity generators of hazardous waste.
	Technology Transfer and Support Division	513/569-7562	Access to the ORD research information and publications.
	TSCA Hotline	202/554-1404	Assistance and guidance on TSCA regulations.
	Enviro\$en\$e	<a href="http://es.inel.gov">http://es.inel.gov</a>	Solvent alternatives, international, federal and state programs, other research and development. Also, environmental profiles of various industrial categories.
	US EPA Home Page	<a href="http://www.epa.gov">http://www.epa.gov</a>	Information about EPA regulations, initiatives, and links to the home pages of other agencies and EPA regional offices.

## FEDERAL AGENCIES

Organization	Resource	Telephone Number / Internet Address	Description
<b>U.S. Small Business Administration</b>	SBA Answer Desk  SBA Home Page	1-800-8-ASK-SBA  <a href="http://www.sbaonline.sba.gov">http://www.sbaonline.sba.gov</a>	Information about SBA programs, and telephone numbers for local offices.  Information about business services available to your organization, with links to other related sites.
<b>Government Printing Office</b>	GPO Superintendent of Documents	202/512-1800	Information about available documents and instructions on ordering GPO publications.
<b>US Department of Energy</b>	Pollution Prevention Information Clearinghouse	<a href="http://www.er.doe.gov/production/esh/epic.html">http://www.er.doe.gov/production/esh/epic.html</a>	Pollution prevention and environmental design information.

Note: This list is not intended to be comprehensive. Appearance on this list should not be construed as an endorsement by GETF of any products/service.

## STATE AGENCIES

Organization	Resource	Telephone Number / Internet Address	Description
<b>State Environmental Protection Agencies</b>	Environmental Assistance Programs	Contact your state's Environmental Protection Agency	Many state environmental protection agencies provide publications, technical assistance, and information on pollution prevention technologies, waste reduction, and regulatory compliance, at little or no charge.
<b>State Environmental</b>	Small Business Assistance Programs (Mandated under Title V of the Federal Clean Air Act).	Call the EPA Small Business Ombudsman (800/368-5888) to contact the Small Business Assistance Program in your state.	Provides information and technical assistance to small businesses regulated under the Clean Air Act.

USAID/Office of Energy, Environment and Technology

## STATE AGENCIES

<b>Organization Protection Agencies (cont'd)</b>	<b>Resource</b>	<b>Telephone Number / Internet Address</b>	<b>Description</b>
	State and Local Pollution Prevention Programs	Contact the National Pollution Prevention Roundtable (202/466-7272) for the phone number and address of the pollution prevention program in your state.	Provides information and technical assistance on pollution prevention.
	Michigan Department of Environmental Quality	<a href="http://www.deq.state.mi.us">http://www.deq.state.mi.us</a>	Fact sheets, training, and technical assistance.
	Minnesota Technical Assistance Program	<a href="http://es.inel.gov/techinfo/facts/mpca/mpca.html">http://es.inel.gov/techinfo/facts/mpca/mpca.html</a>	Fact sheets on pollution prevention, materials substitution.
	Ohio Department of Environmental Protection	<a href="http://arcboy.epa.ohio.gov">http://arcboy.epa.ohio.gov</a>	Fact sheets on pollution prevention, materials substitution.
	Wisconsin Department of Natural Resources	<a href="http://es.inel.gov/techinfo/facts">http://es.inel.gov/techinfo/facts</a>	Fact sheets on pollution prevention, materials substitution.

*Note: The list shown above represents only a sample of the resources that may be available from state agencies. Contact your state agency for details of existing programs and other forms of assistance available*

## EMS SOFTWARE PACKAGES

Organization	Contact Info	Description
Greenware	1-800-474-0627 www.greenware.com	Provides ISO 14001 assessment, implementation and audit software
EMSoft2000	1-800-241-3618 www.rmtinc.com	Software package based on LotusNotes to support EMS implementation
ISOXpert	1-800-ISO-EASY	Built on LotusNotes platform. Customizable document formats.
ISOSoft 14001	416-679-0119 www.isogroup.simplenet.com/soft14k	Provides ISO 14001 assessment, implementation and audit software. Co-developed with BSI.

## NON-PROFIT ORGANIZATIONS

Organization	Address	Telephone & Fax	Description
Industrial Technology Institute (ITI)	2901 Hubbard Road P.O. Box 1485 Ann Arbor, Michigan 48106-1485	Tel: 1-800-292-4484 Fax: 1-313-769-4064	Technical assistance to small and mid-sized manufacturers. Energy, environment, and manufacturing assessments, as well as performance benchmarking, and QS 9000 and ISO 14000 implementation assistance.
Global Environment & Technology Foundation (GETF)	7010 Little River Turnpike Suite 460 Annandale, VA 22002	Tel: 1-703-750-6401 Fax: 1-703-750-6506	EMS design and implementation assistance primarily to government entities
Manufacturing Extension Partnership (MEP)	Building 301, Room C121 National Institute of Standards and Technology Gaithersburg, Maryland 20899-0001	Tel: 1-301-975-5020 or 1-800-MEP-4MFG Fax: 1-301-963-6556	Assists manufacturers with assessing technological needs, and works to help small manufacturers solve environmental problems with cost-effective solutions.
North American Commission on Environmental Cooperation "Improving Environmental Performance and Compliance: 10 Elements of Effective Environmental Management Systems"	<a href="http://www.cec.org/pubs_info_resources/publications/enforce_op_law/ems.cfm?varlan=english">www.cec.org/pubs_info_resources/publications/enforce_op_law/ems.cfm?varlan=english</a>		Joint expression from three North American governments regarding how voluntary EMS's designed for internal management purposes can also serve broader public policy goals, such as compliance assurance and improved environmental performance.